

Dynamic Multi-Modality Fused Imaging, Analysis, Computer Aided Diagnosis System

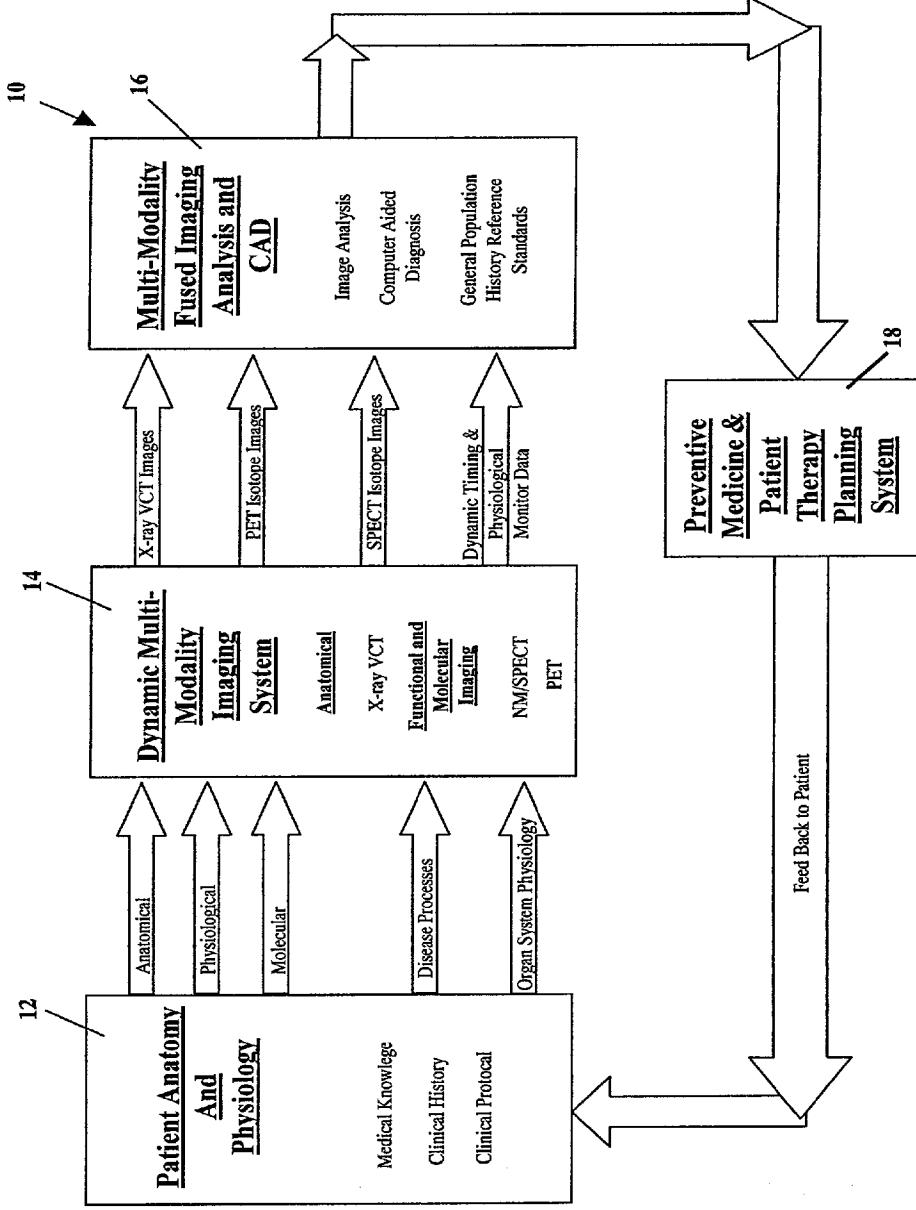


Figure 1

Multi-Modality Imaging System with Common Focused 2D Curved Detector

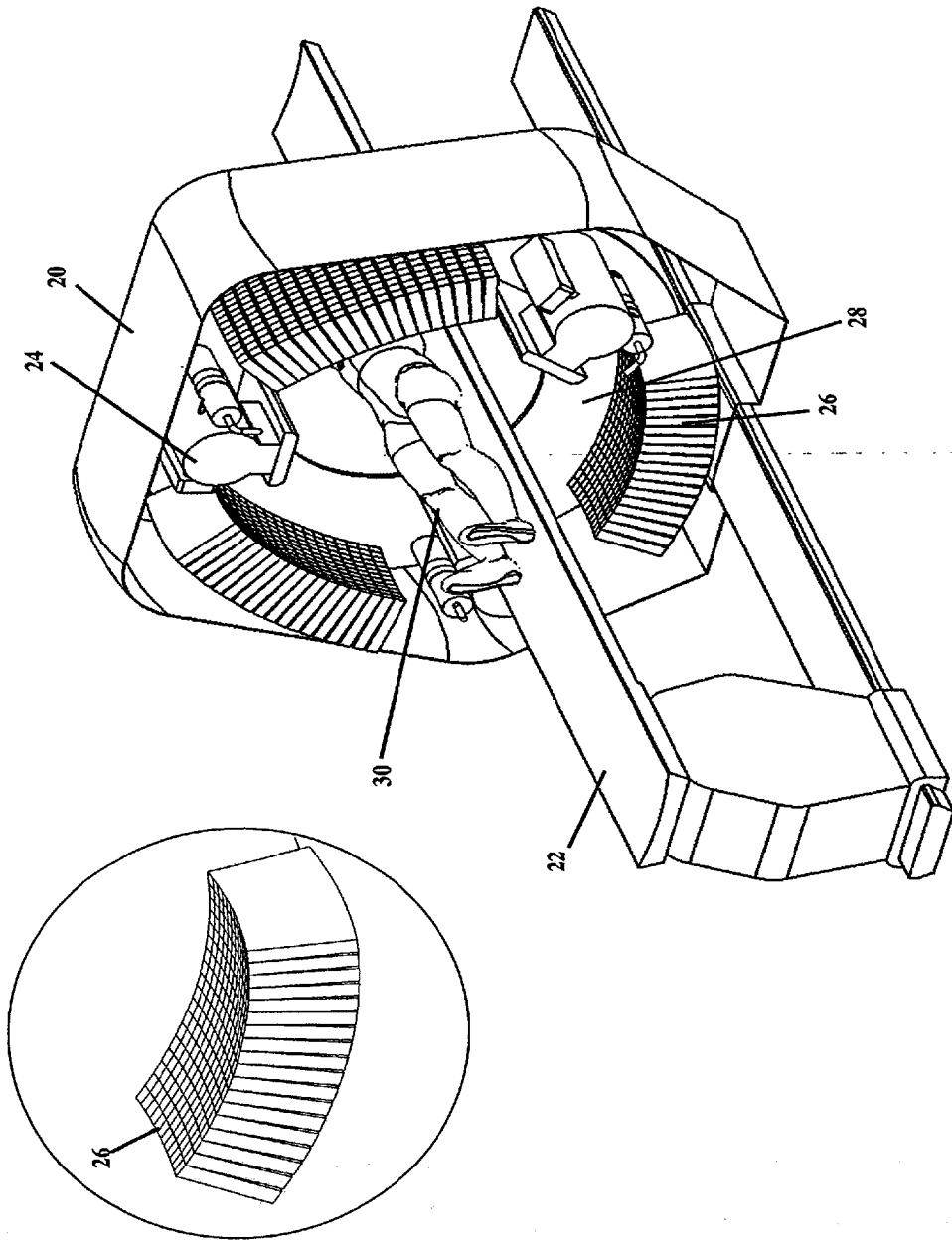


Figure 2

Overall Multi-Modality Imaging System Block Diagram

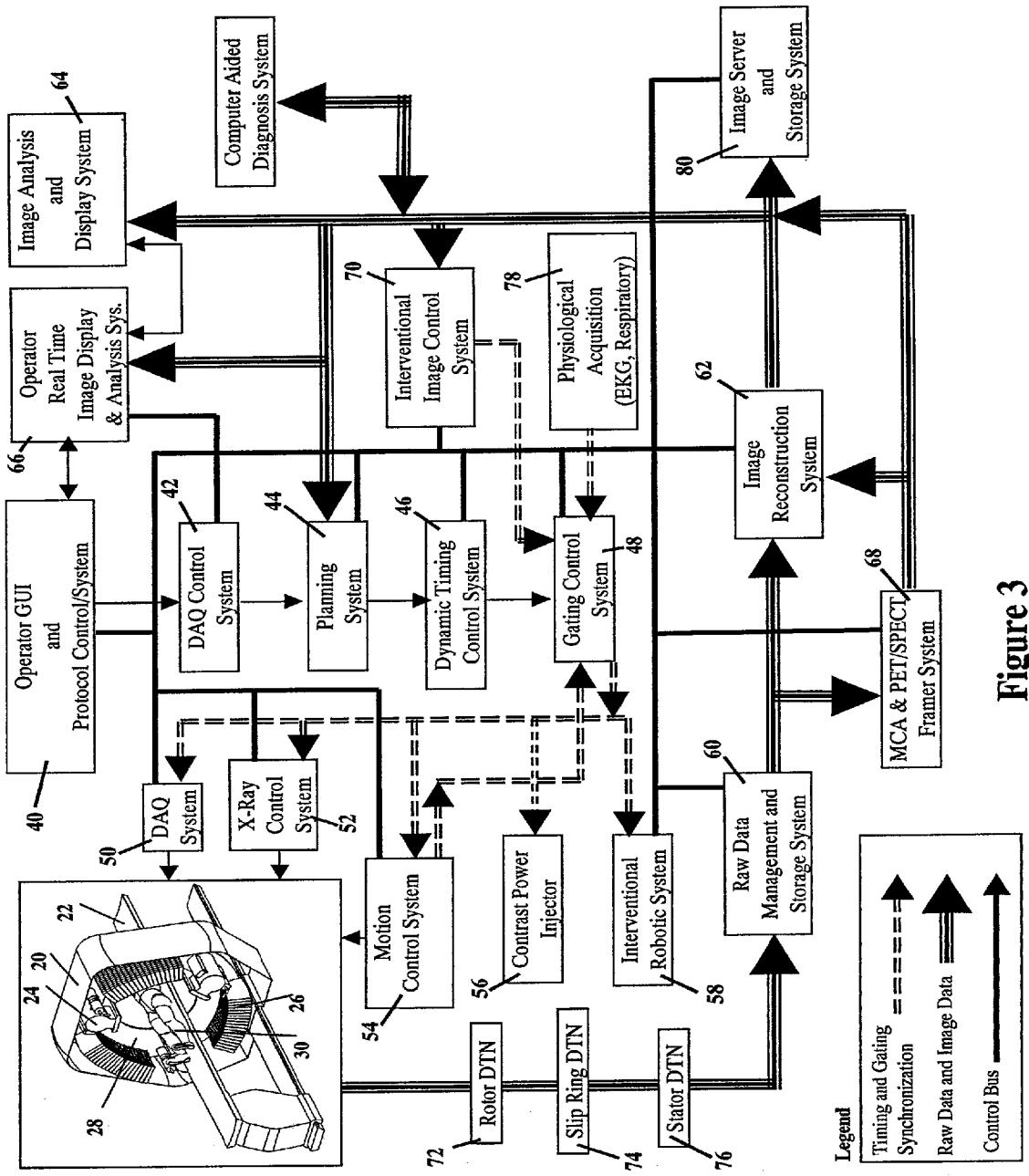


Figure 3

X-ray & Focused 2D Curved Detector Arrangement

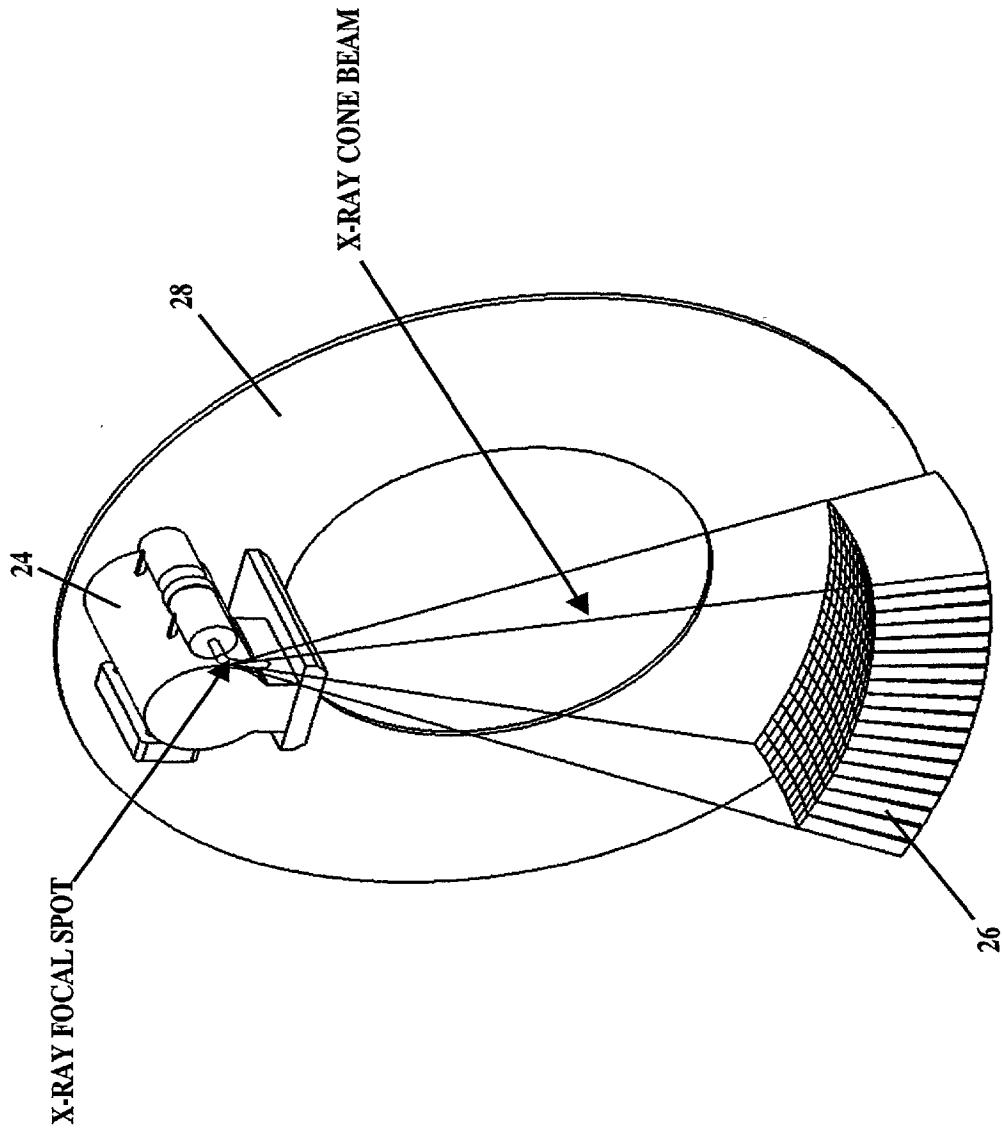


Figure 4

Cone Beam Source Collimation & Cone Beam Shaped Filter

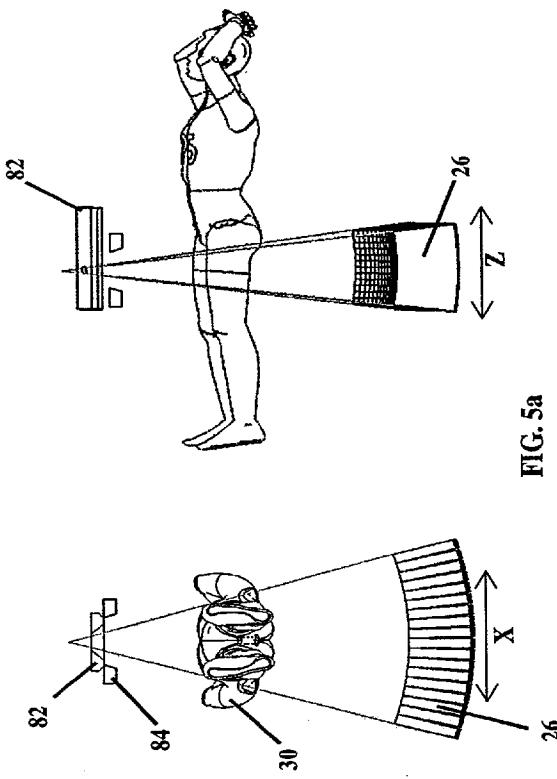
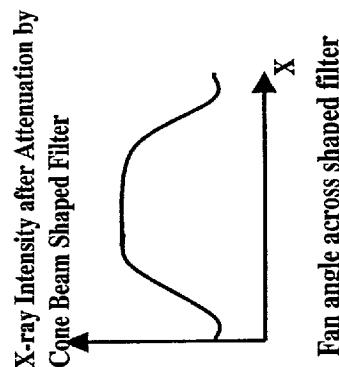


FIG. 5a



Intensity after Attenuation by
Shaped Filter and Patient

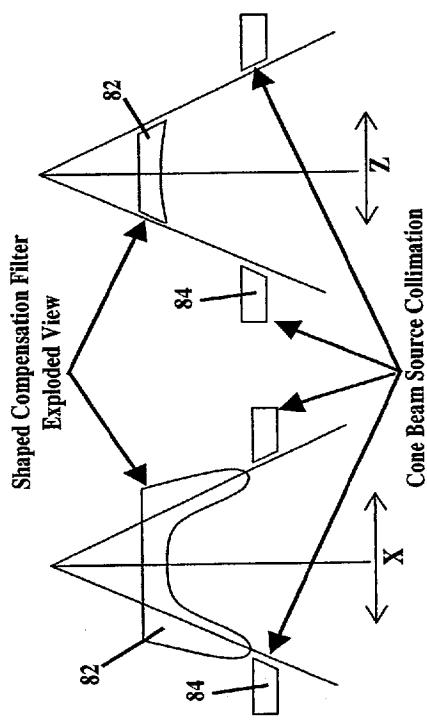
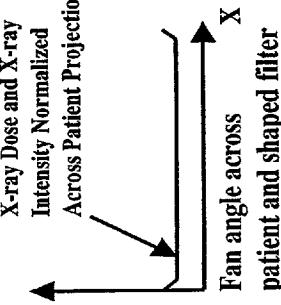
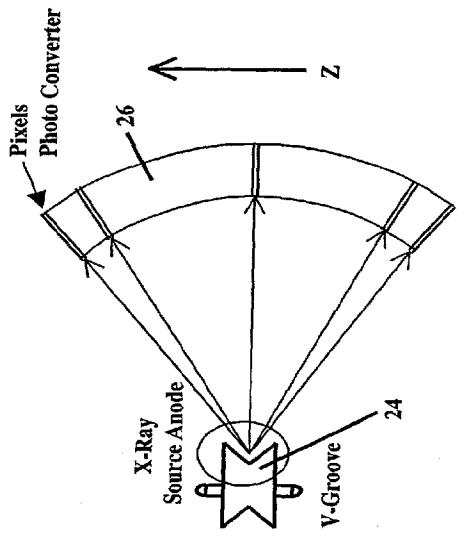


Figure 5

X-ray Cone Beam Focal Spot - Curved Detector Optics

Curved Detector to reduce spatial resolution loss and Best Conversion efficiency of X-ray



Focal spot from V-groove Type Anode has similar spot size appearance

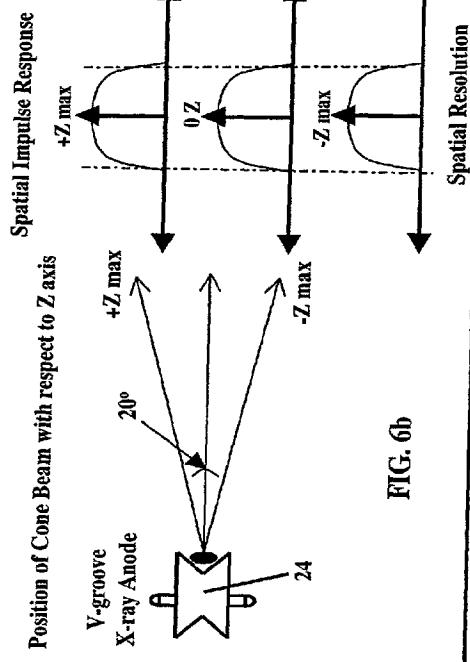


FIG. 6b

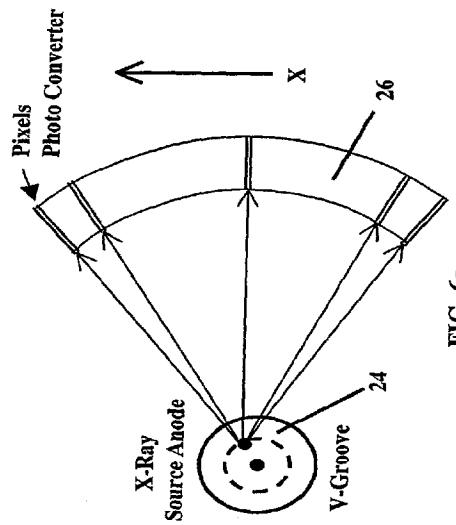


FIG. 6a

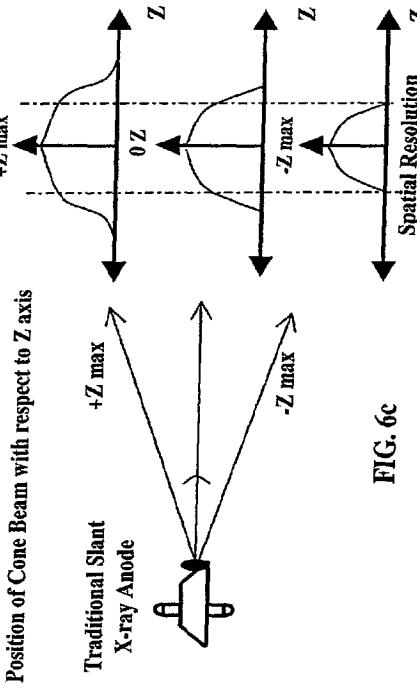


FIG. 6c

Figure 6

2 Dimensional Focal Spot Dithering for Improved Cone Beam

Spatial Resolution

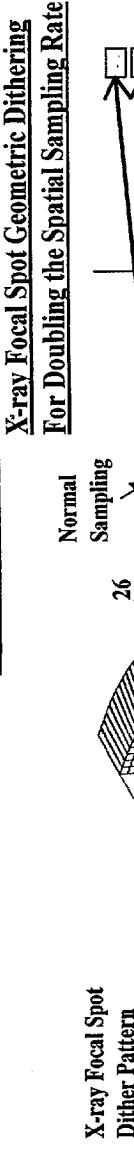


Figure 7a

2D X-ray Focal Spot
Dither Pattern for 3D
Cone Beam VCT

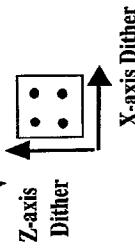


Figure 7d

X-ray Focal Spot Geometric Dithering For Doubling the Spatial Sampling Rate

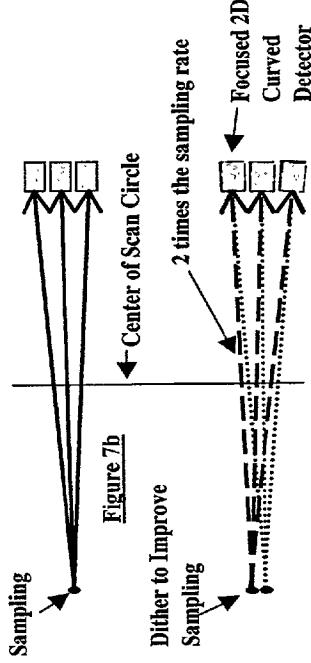
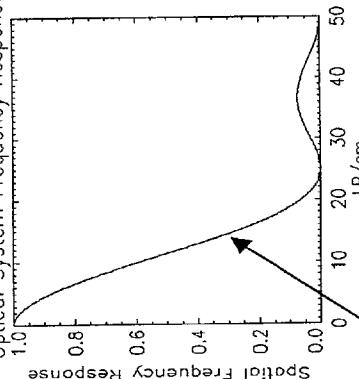


Figure 7b

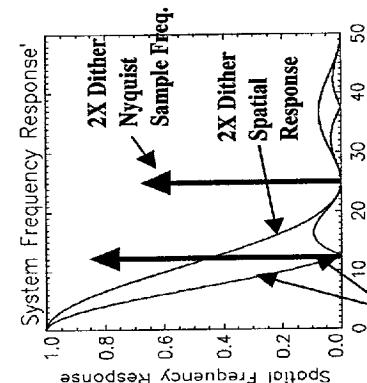
Optical System Frequency Response



X-ray Optical
System Response
before Sampling

Figure 7e

Spatial Resolution comparison between
Single Sampling and 2X Dither Sampling



Normal Nyquist Sample
Freq. & aliased optical
response

Figure 7f

Figure 7

Focused 2D Curved Detector Module

Focused Curved Detector Module

View Showing Focused 2D Anti-scatter Collimation with 2D Focused Pixels

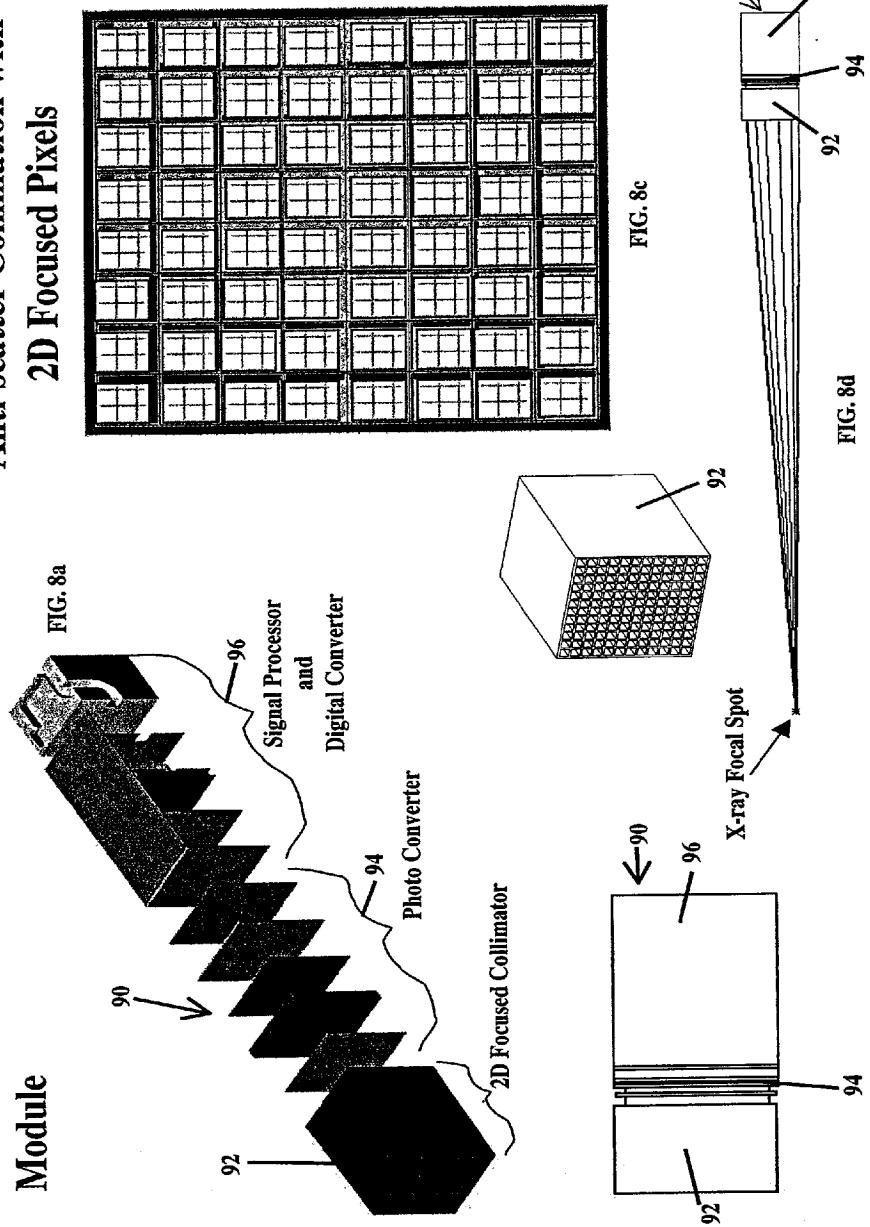


Figure 8

Focused 2D Area Detector with Adaptive Shaped X-Ray Optical Response

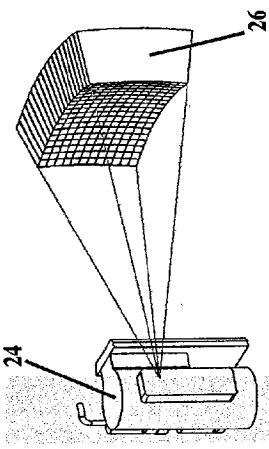
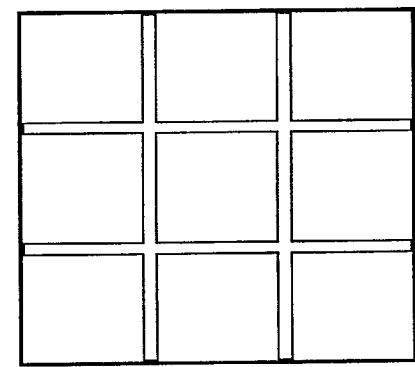
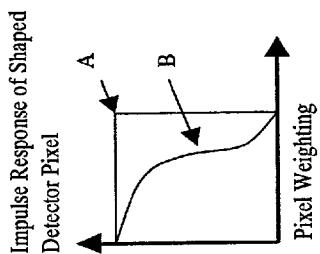


FIG. 9a

Impulse Response Shaping from Rectangular to
Variable Gaussian Roll-off Function.
Shaping may be Fixed or Controlled



Detector Pixel
FIG. 9b



Impulse Response of Shaped
Detector Pixel

.2	.44	.2
.44	1	.44
1	1	1
.44	1	.44

FIG. 9f

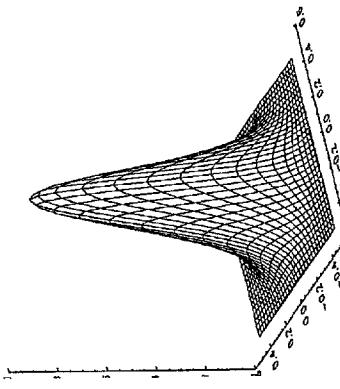


FIG. 9e

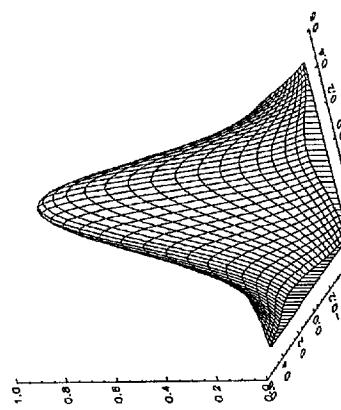


FIG. 9d

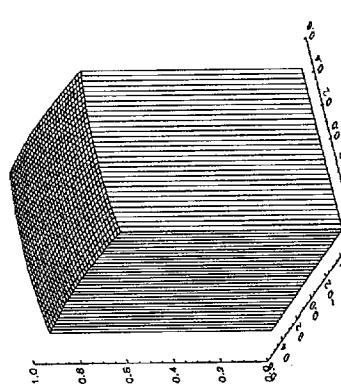


FIG. 9c

Figure 9

Multi-Modality XGA Detector Module

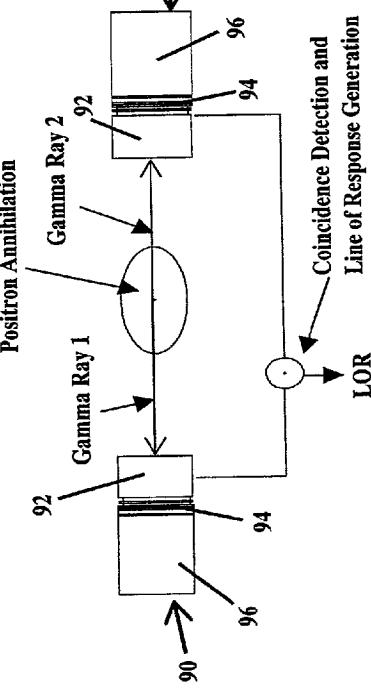
X-Ray Mode

FIG. 10a



PET Mode

FIG. 10b



NM/SPECT Mode

FIG. 10c

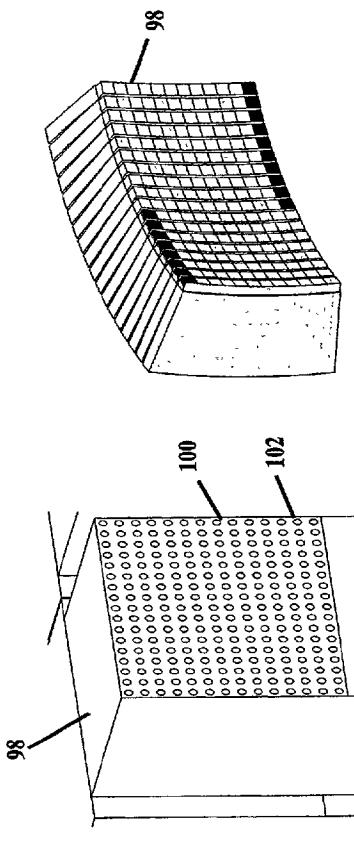


Figure 10

Detector Module Multi-Modality Collimation

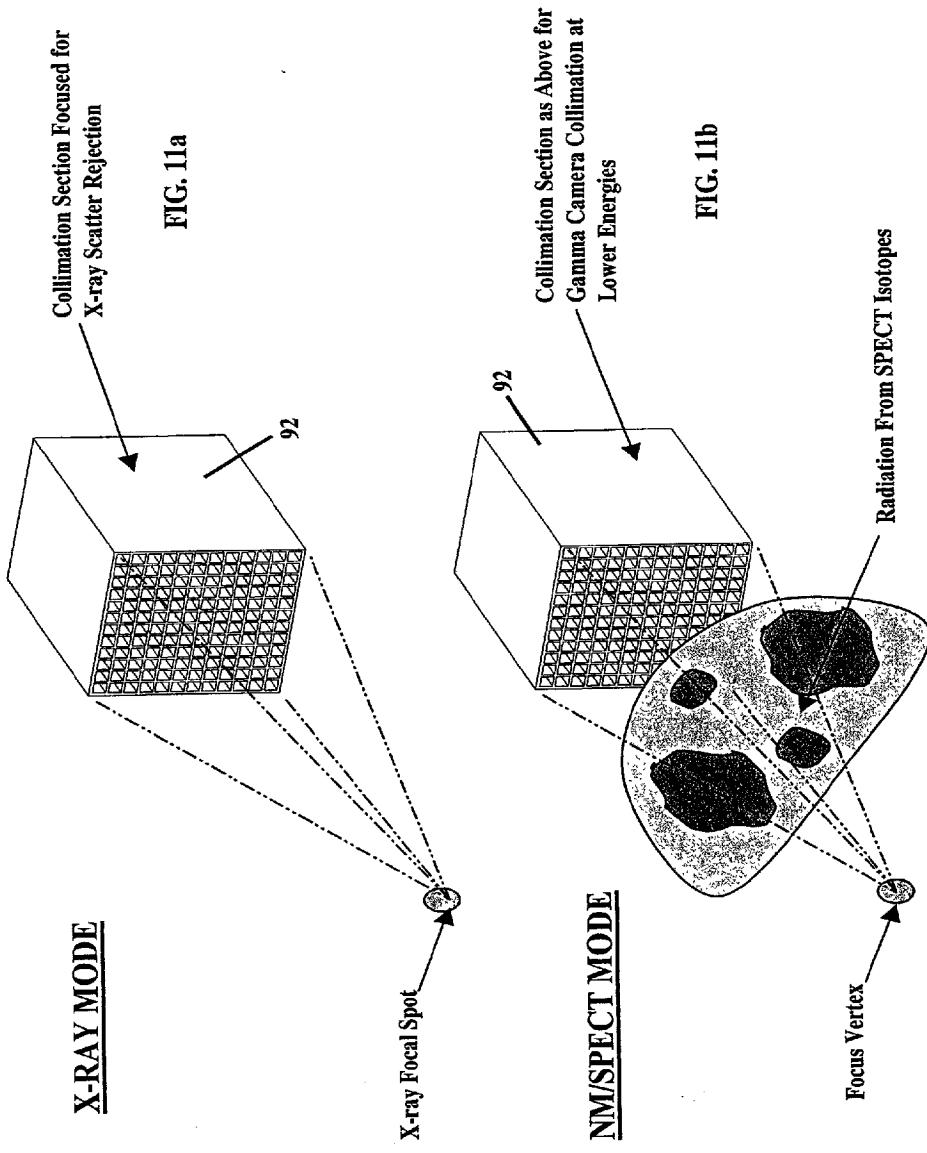


Figure 11

XGA Detector Module Signal Processing

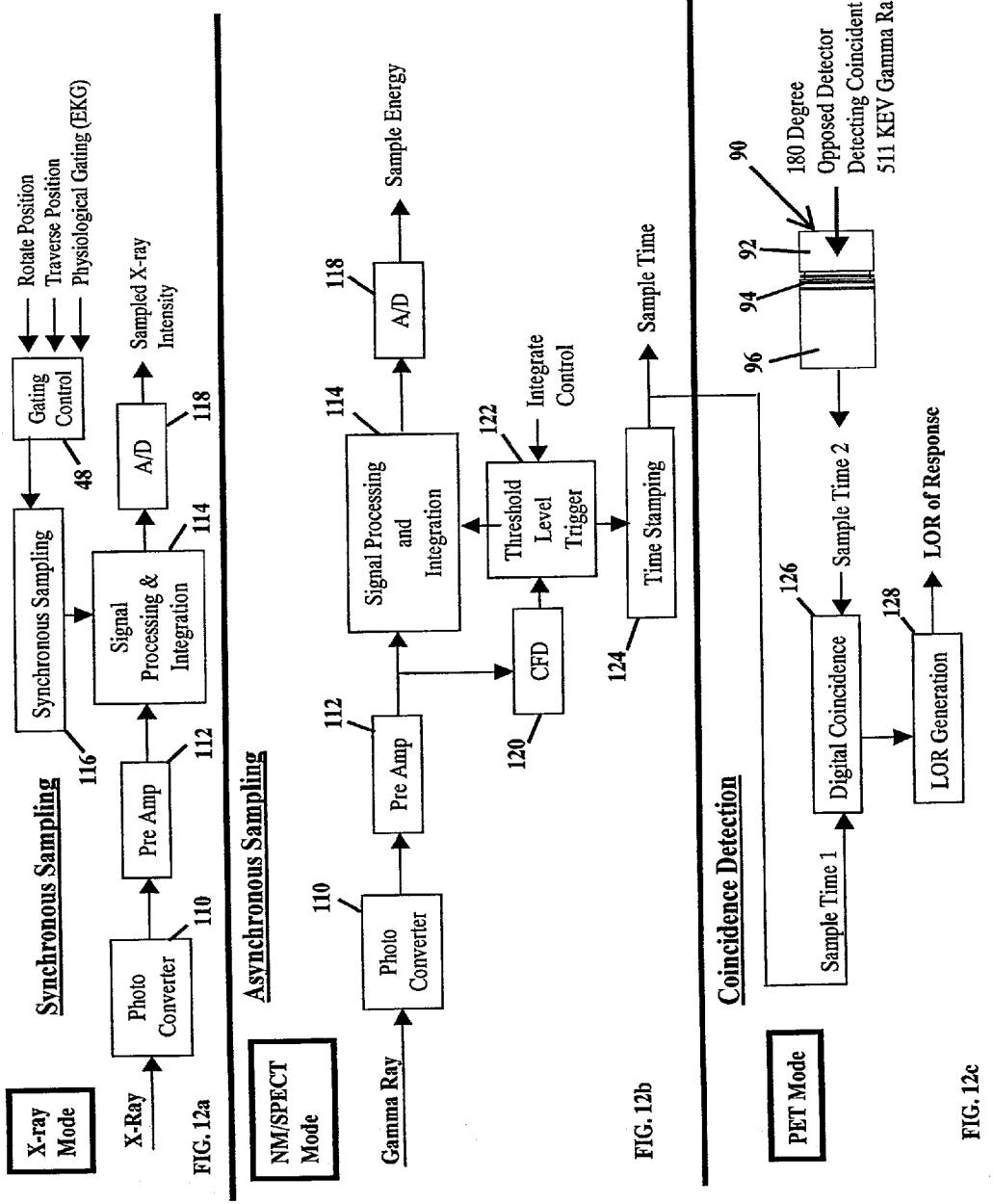


Figure 12

System with Optional PET Anti-Scatter Baffle

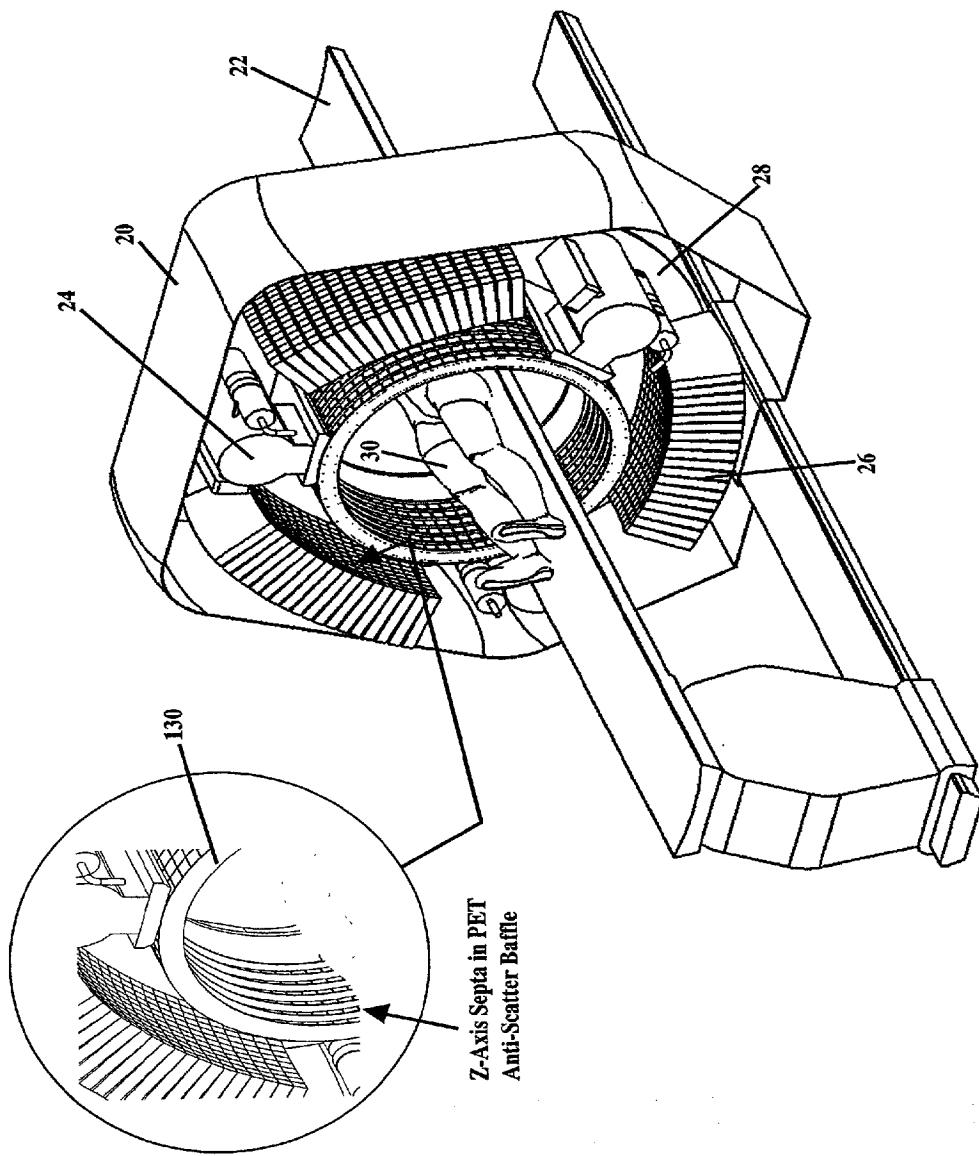
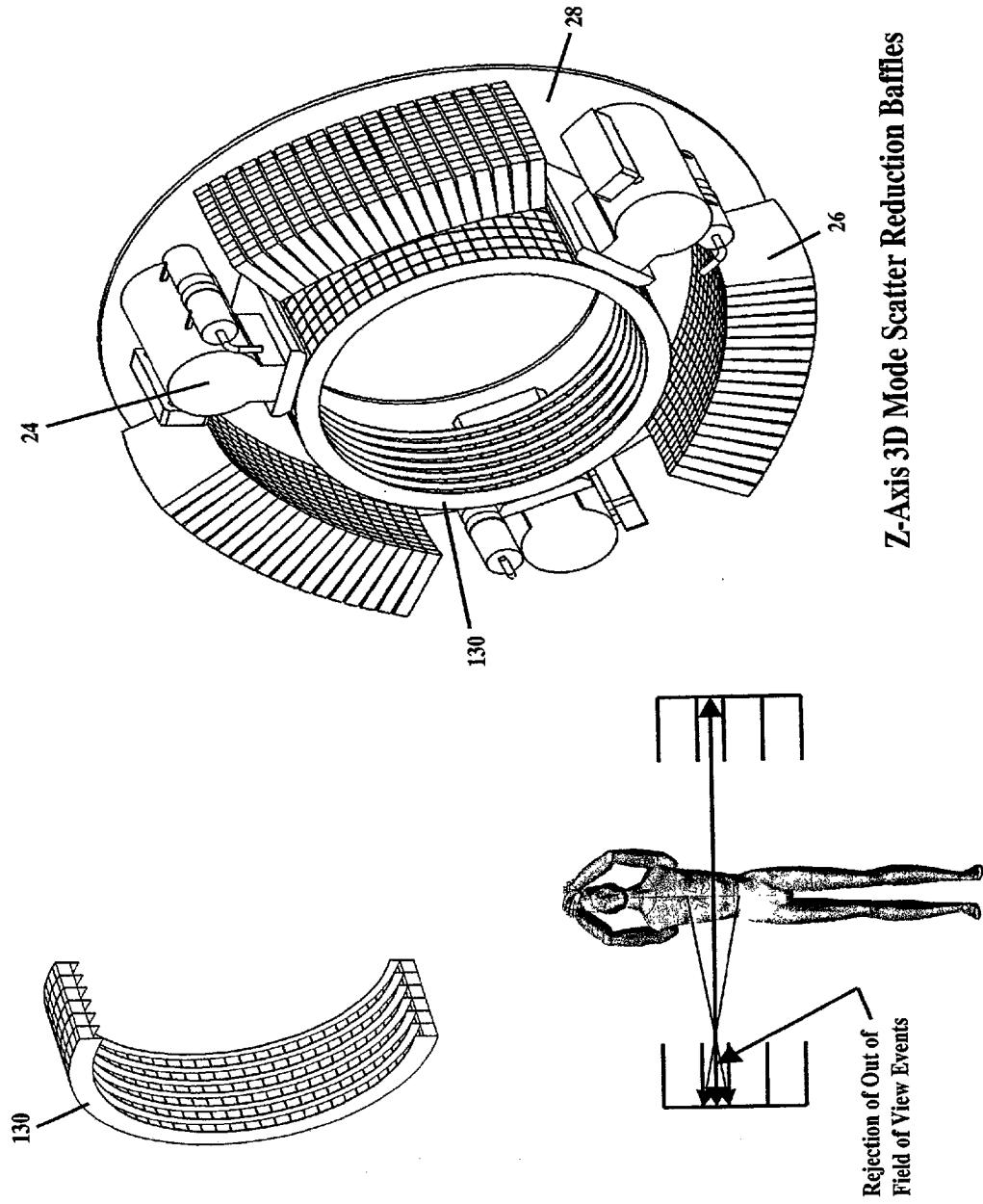


Figure 13

PET - Anti-Scatter Baffle SEPTA



Z-Axis 3D Mode Scatter Reduction Baffles

Figure 14

System With Cone Beam Focused NM/SPECT Collimation

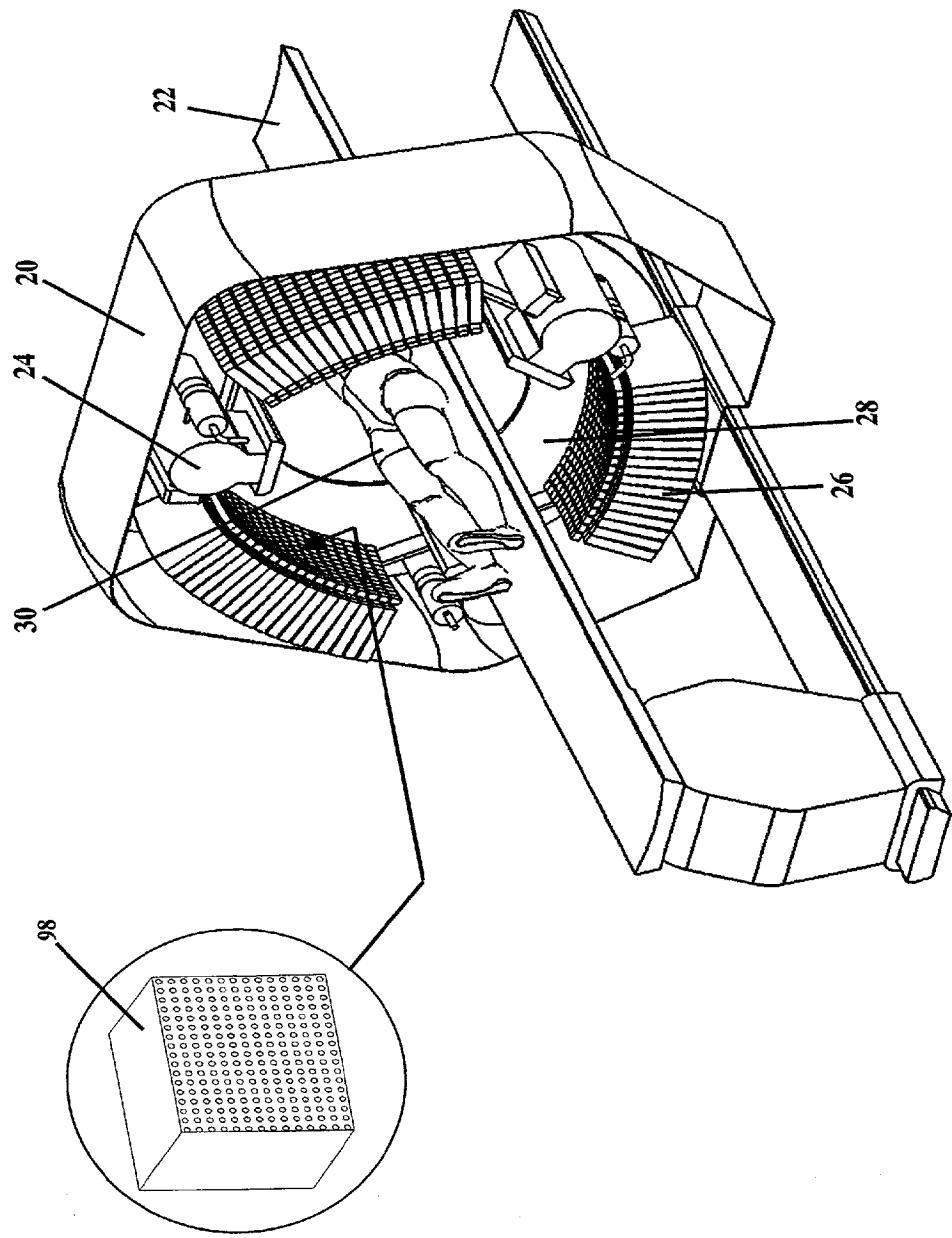


Figure 15

NM/SPECT Mode with Collimation Ring

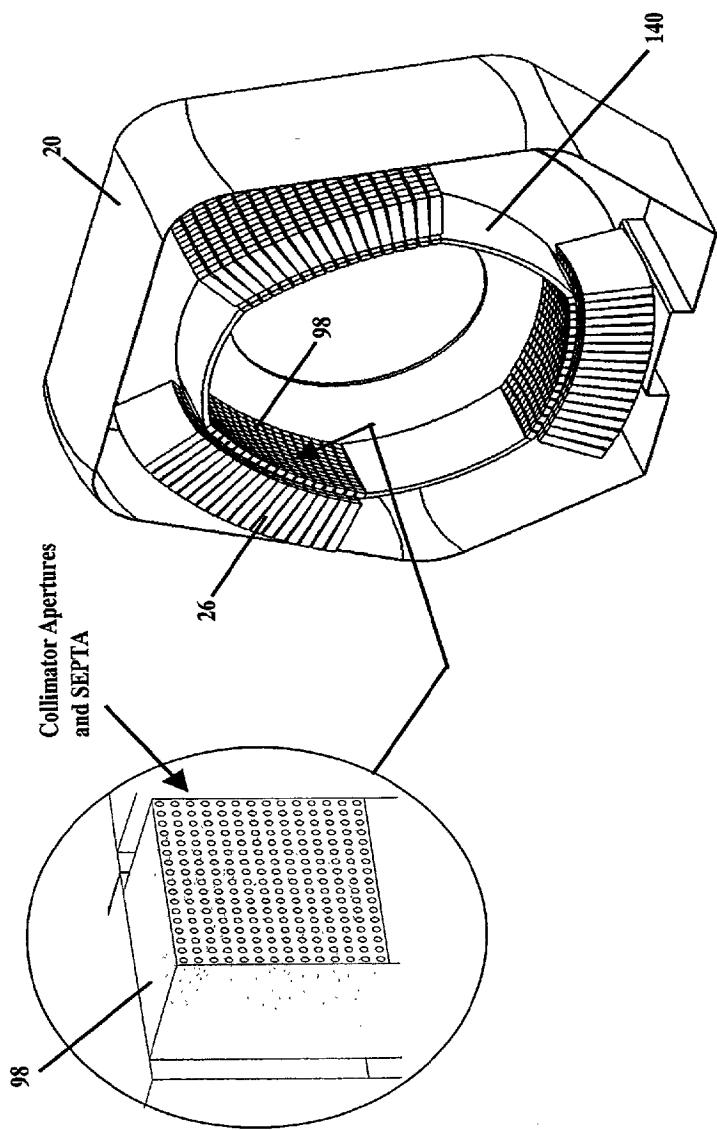
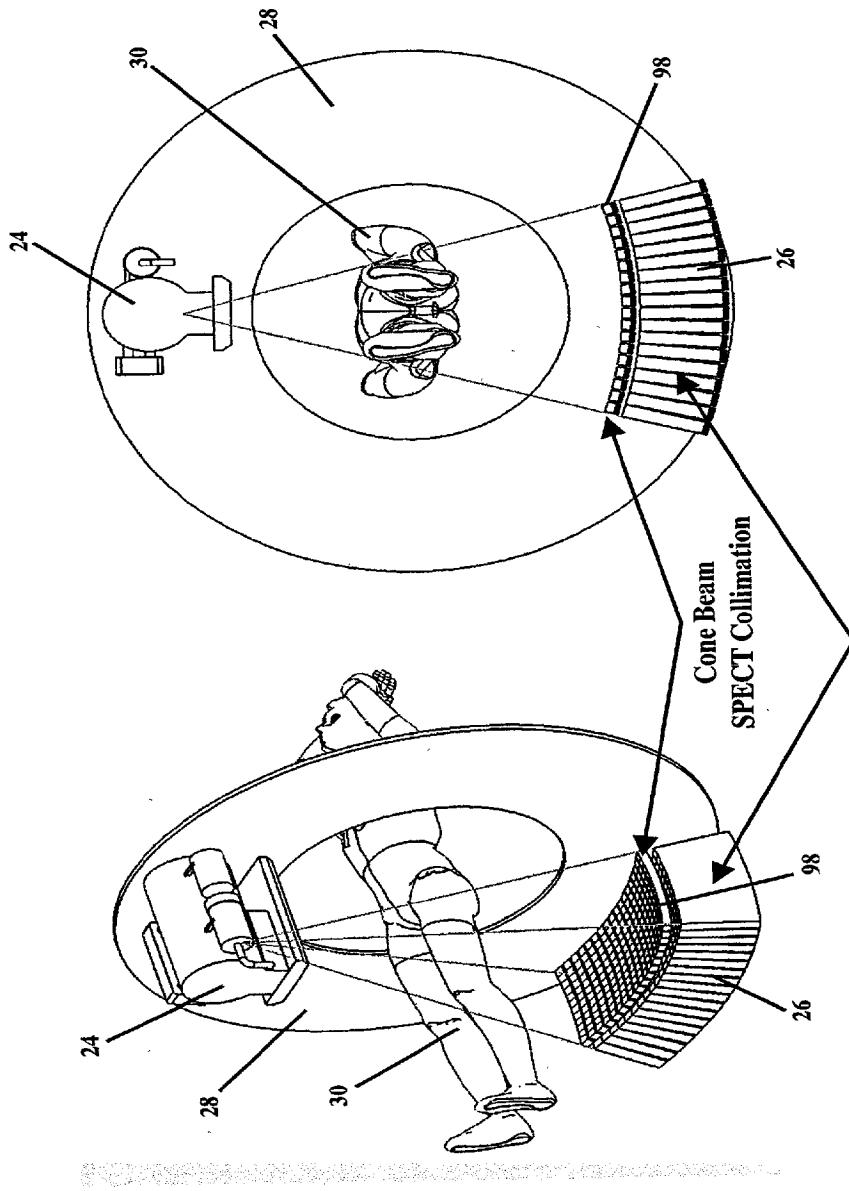


Figure 16

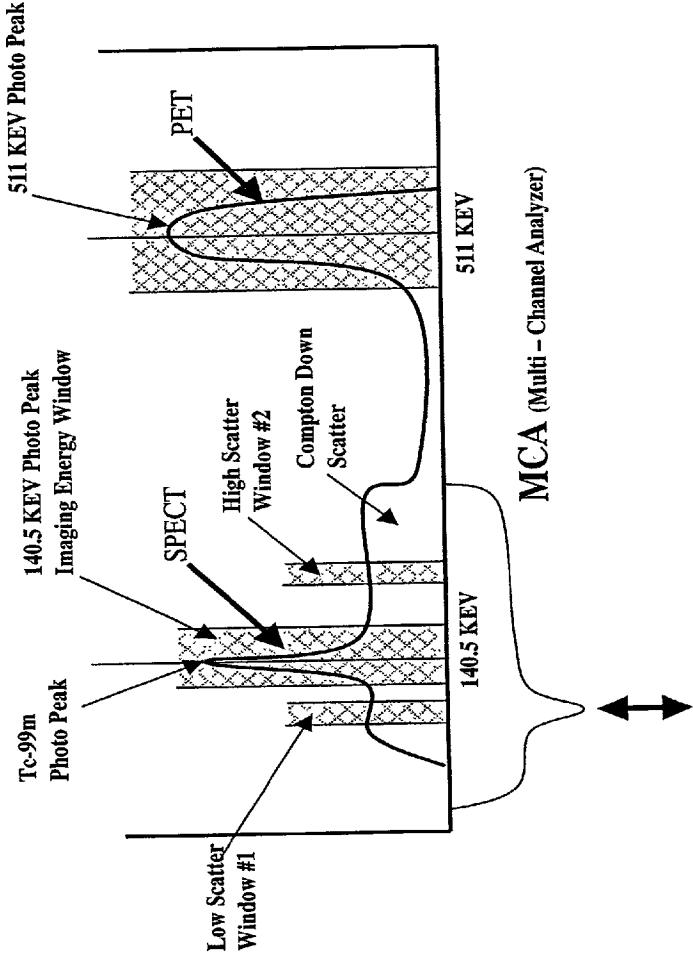
Cone Beam NM/SPECT LEHR Collimation and Focused 2D Curved
Detector Array



X-ray Gamma Ray Area Detector. [XGAI] Detector Which
is Focused at Point Where X-ray Focal Spot is.

Figure 17

Multi-Isotope Scanning



- Scatter Correction and 511 KEV Photo Peak Suppression for SPECT Imaging
- NM/SPECT Detector Must Function with 511 KEV Isotope Present for Multi-Isotope Imaging

Figure 18

X-Ray Detector Scatter Rejection with Focused 2D Curved Collimation

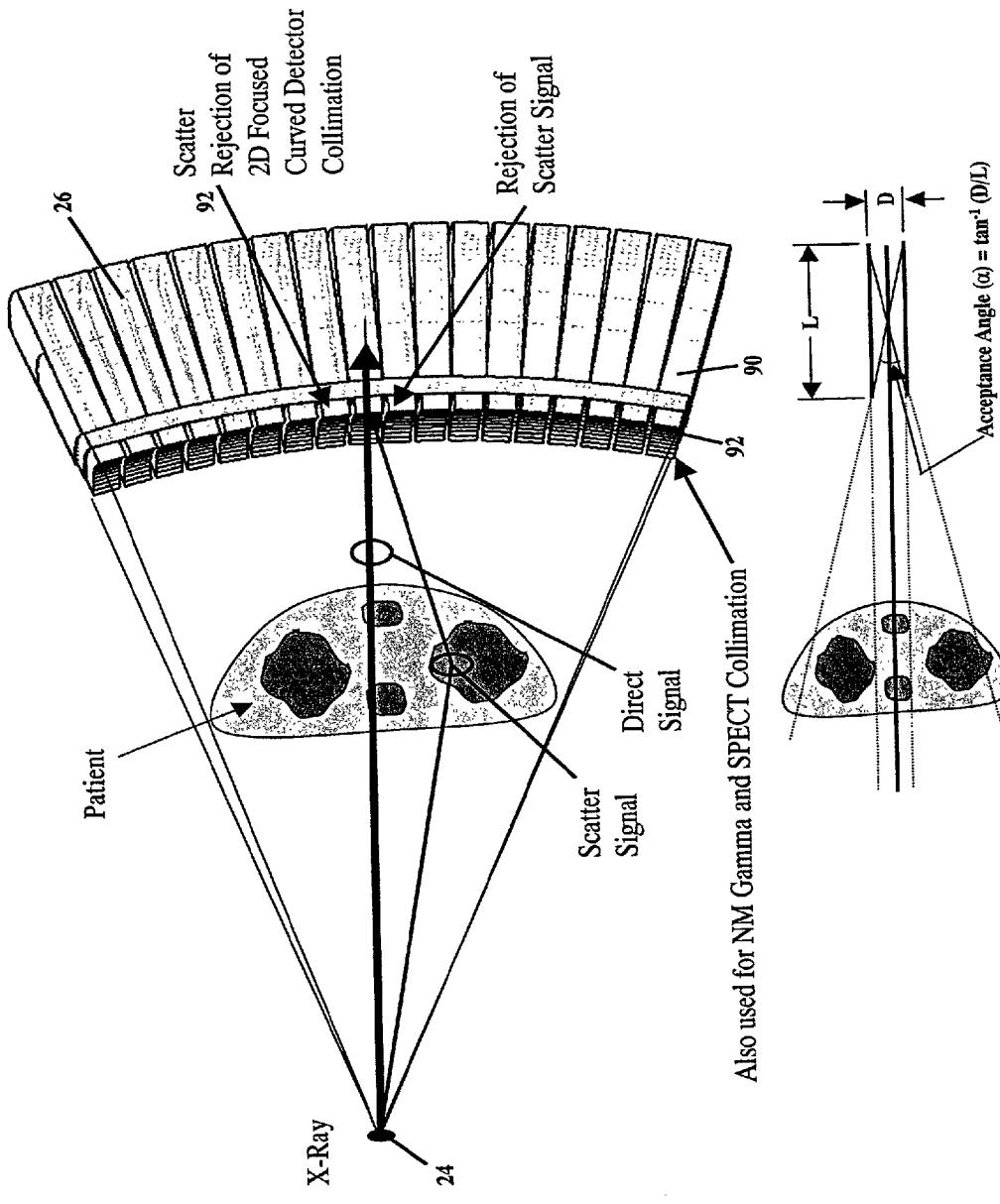


Figure 19

Sequencing of X-ray Sources for Adaptive Scatter Correction

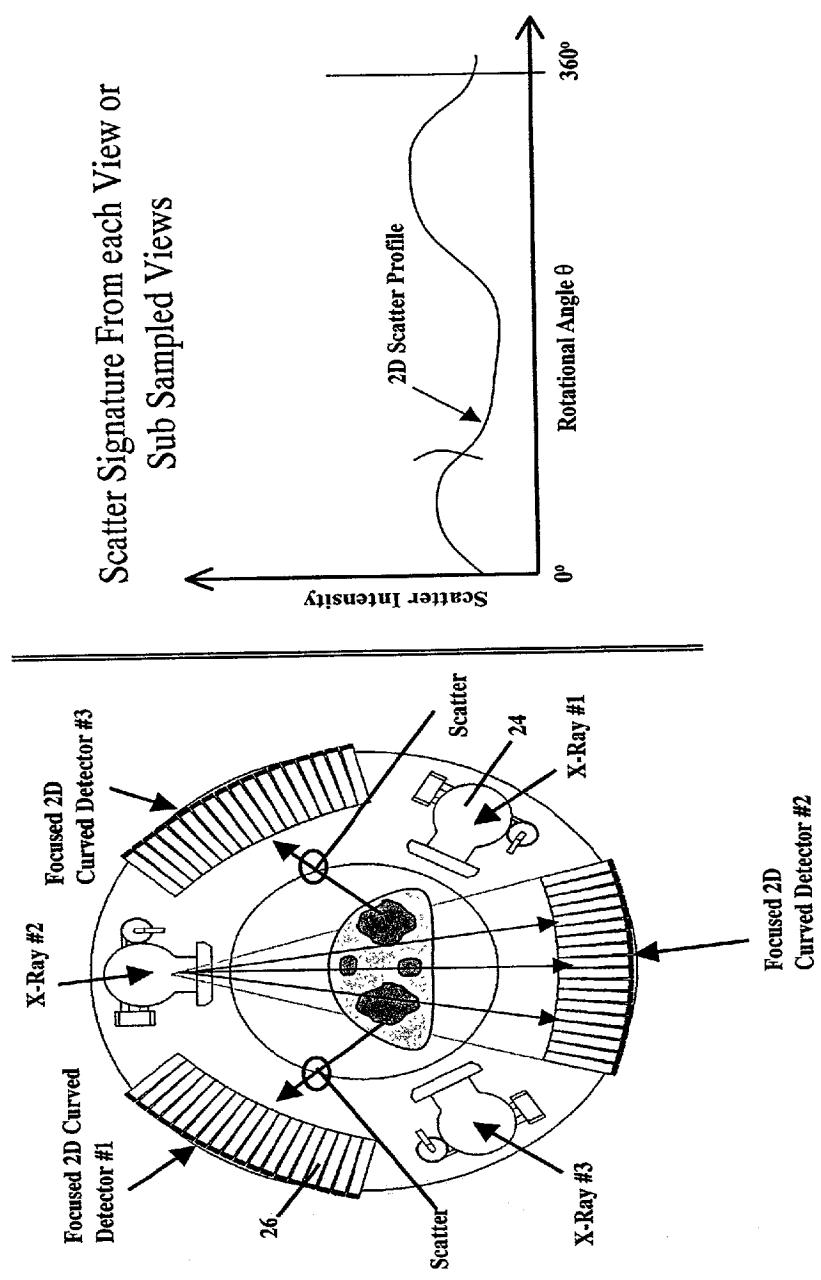


Figure 20

Modulation and Demodulation for Scatter Correction with Multiple Sources

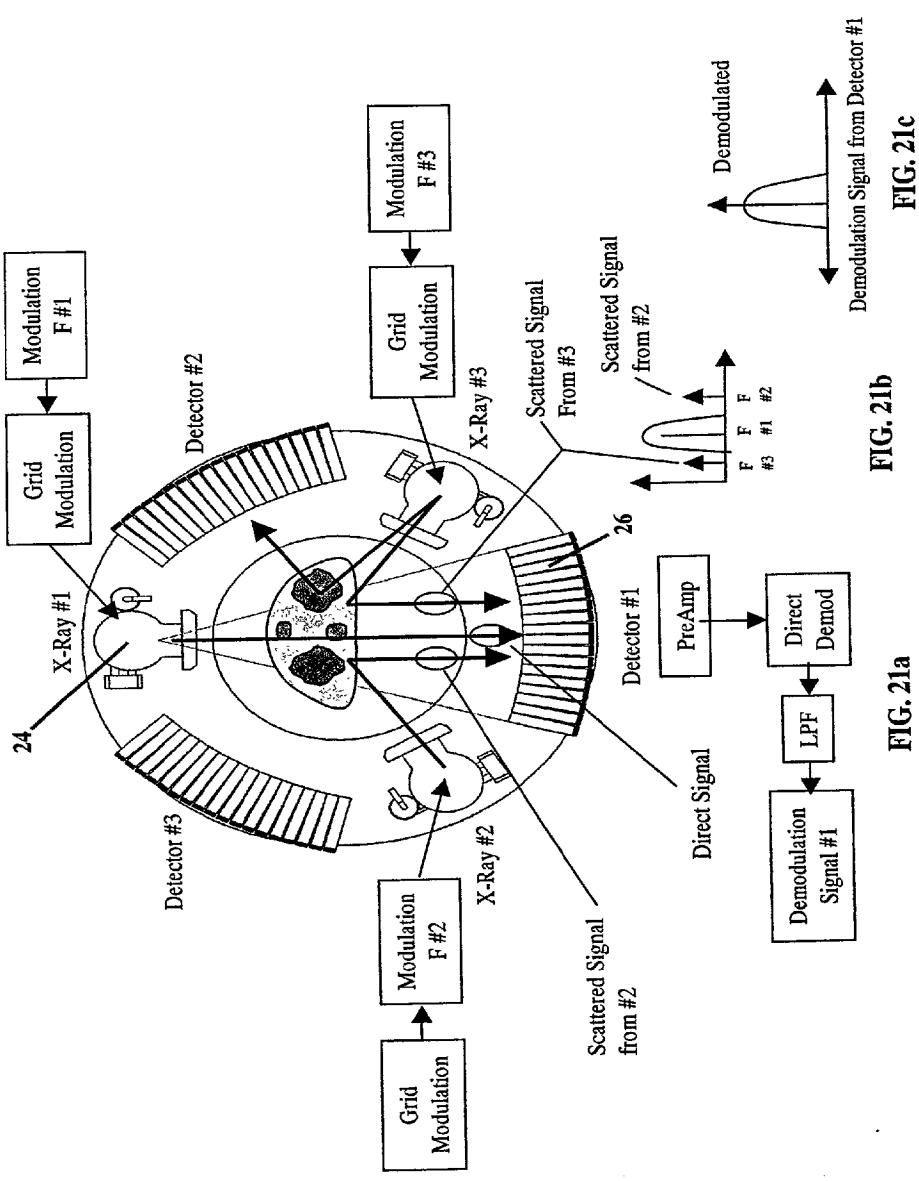


Figure 21

FIG. 21a
FIG. 21b
FIG. 21c

System Level Diagram of Modulation and Demodulation For Multiple Sources for VCT

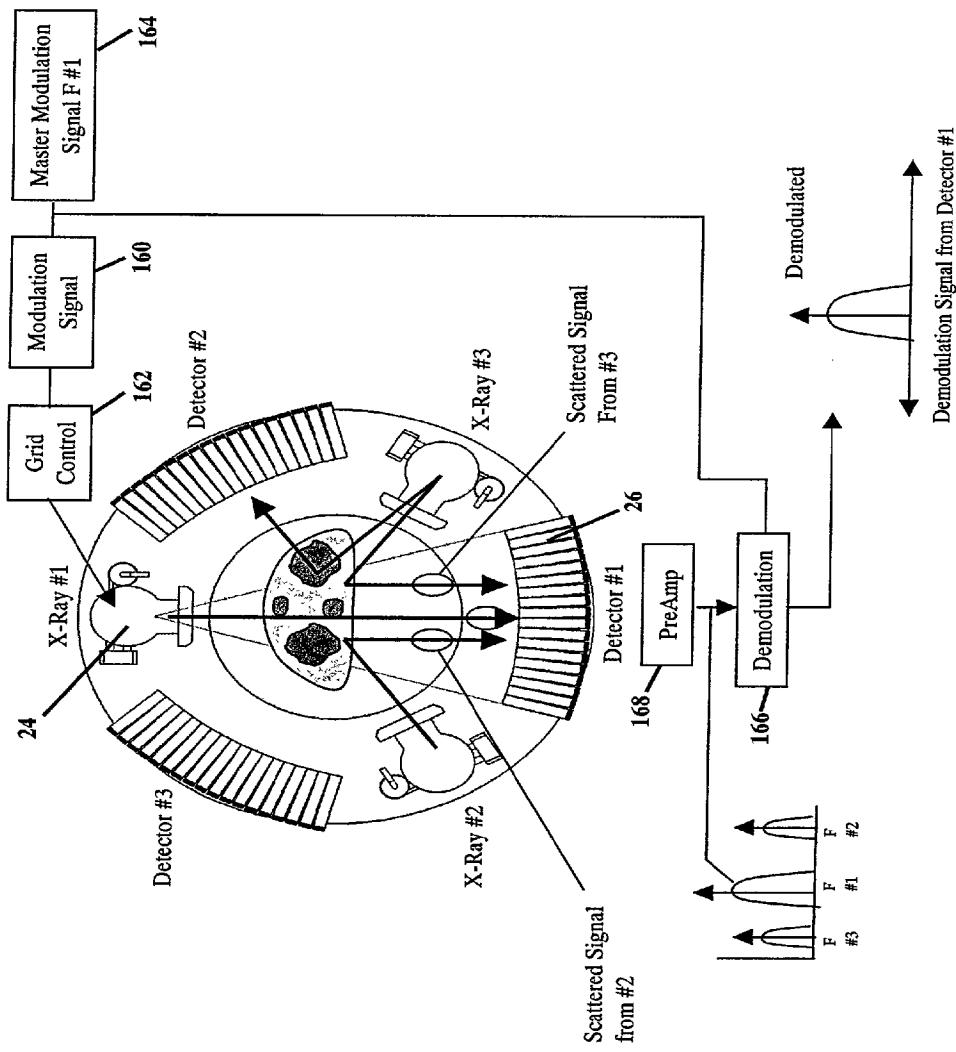


Figure 22

Step and Shoot VCT Imaging

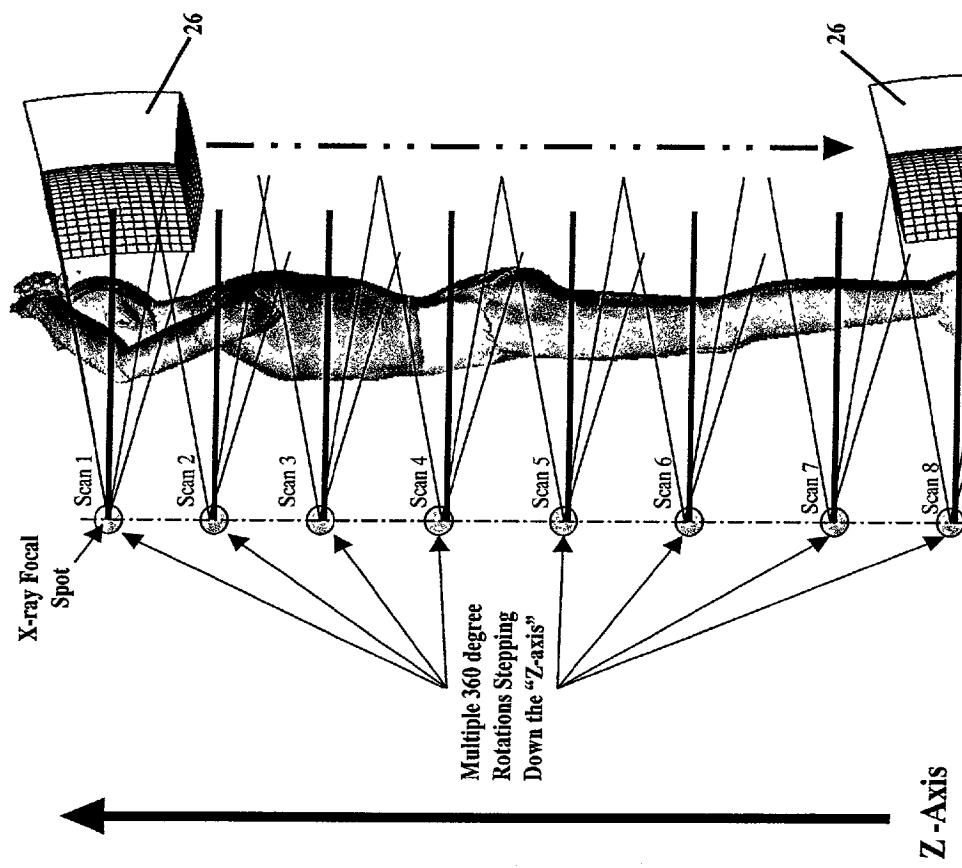


Figure 23

Spiral 3D X-Ray, DAQ and VCT for Cone Beam Reconstruction

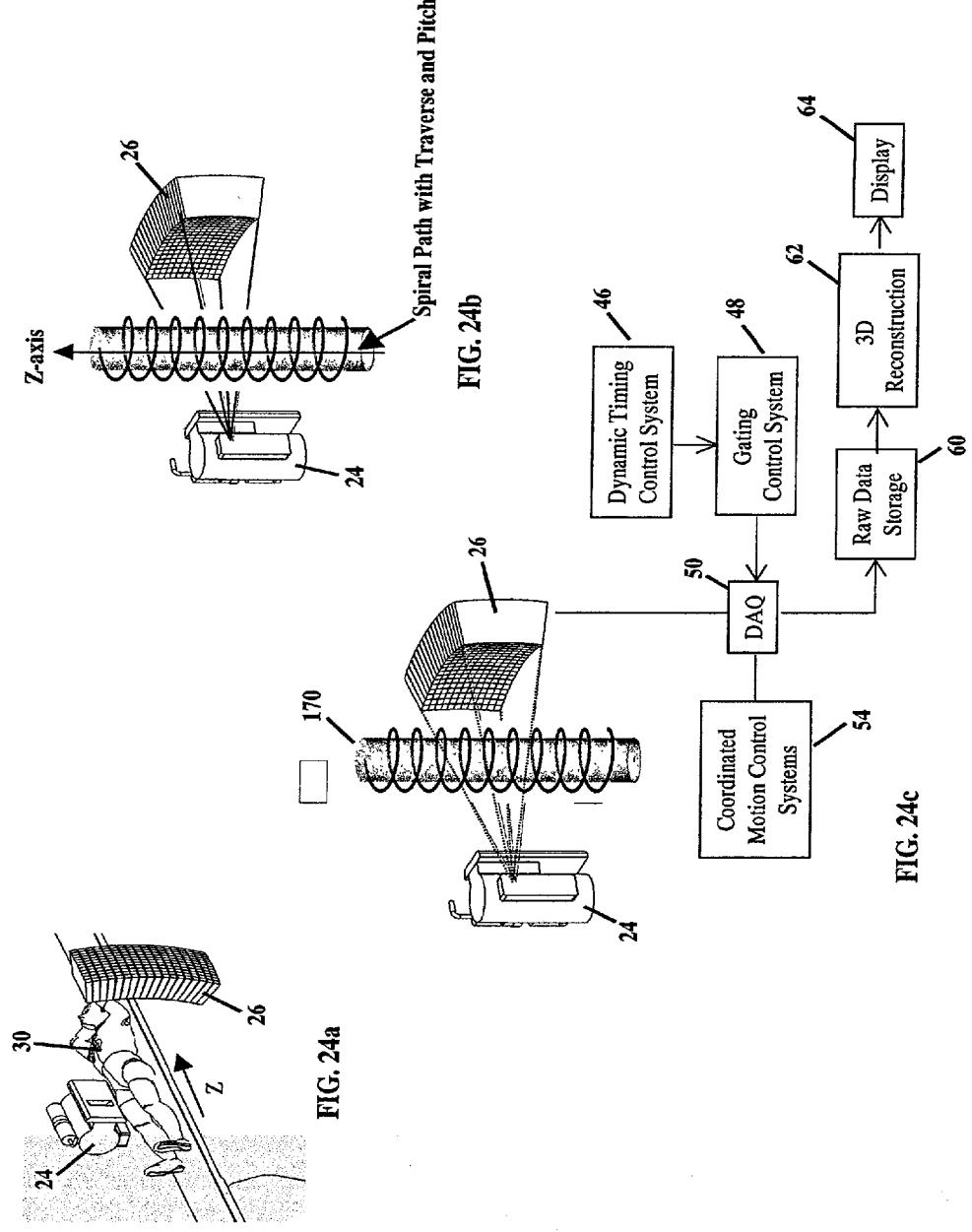
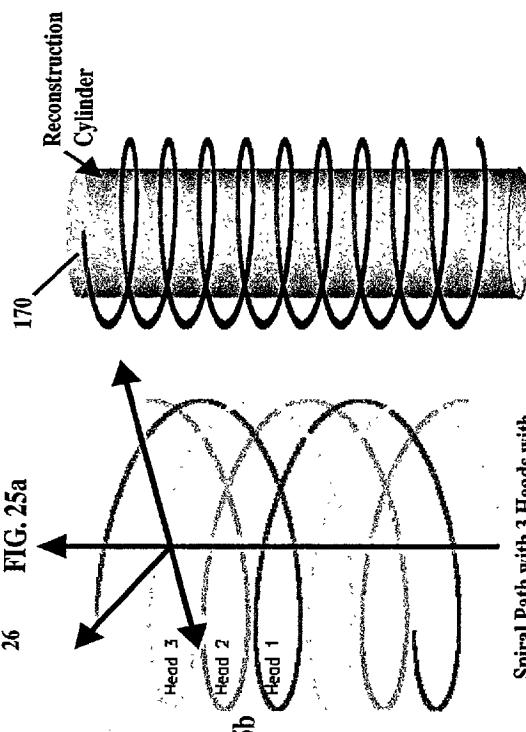
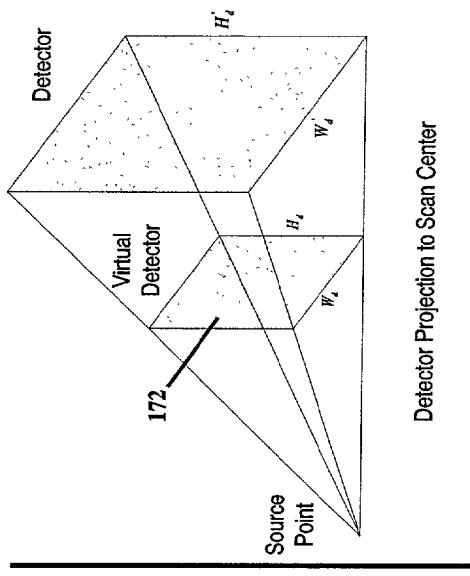
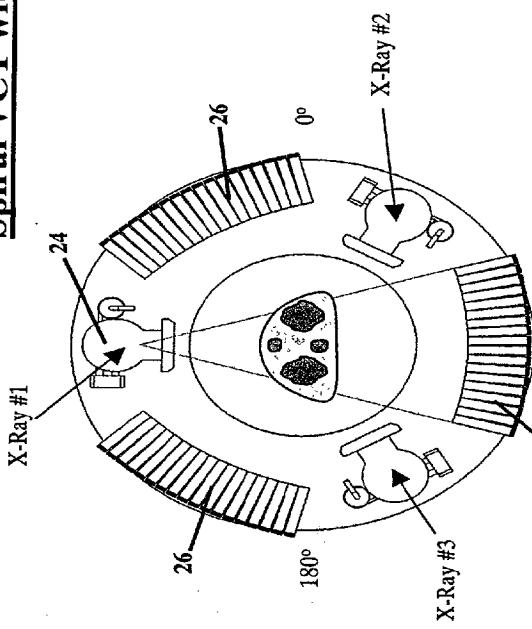


Figure 24

Spiral VCT with Multiple Heads



Spiral Path with 3 Heads with
respective Central Rays on
Reconstruction Cylinder

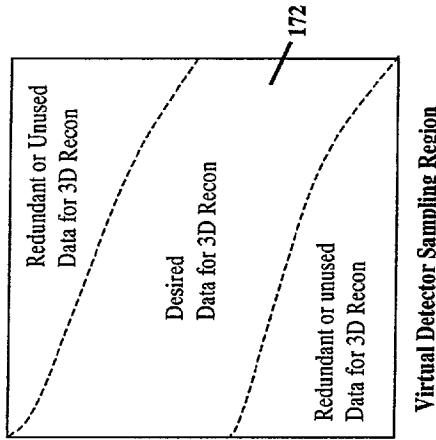


Figure 25

Cone Beam Slant Source Collimation for Spiral VCT Imaging

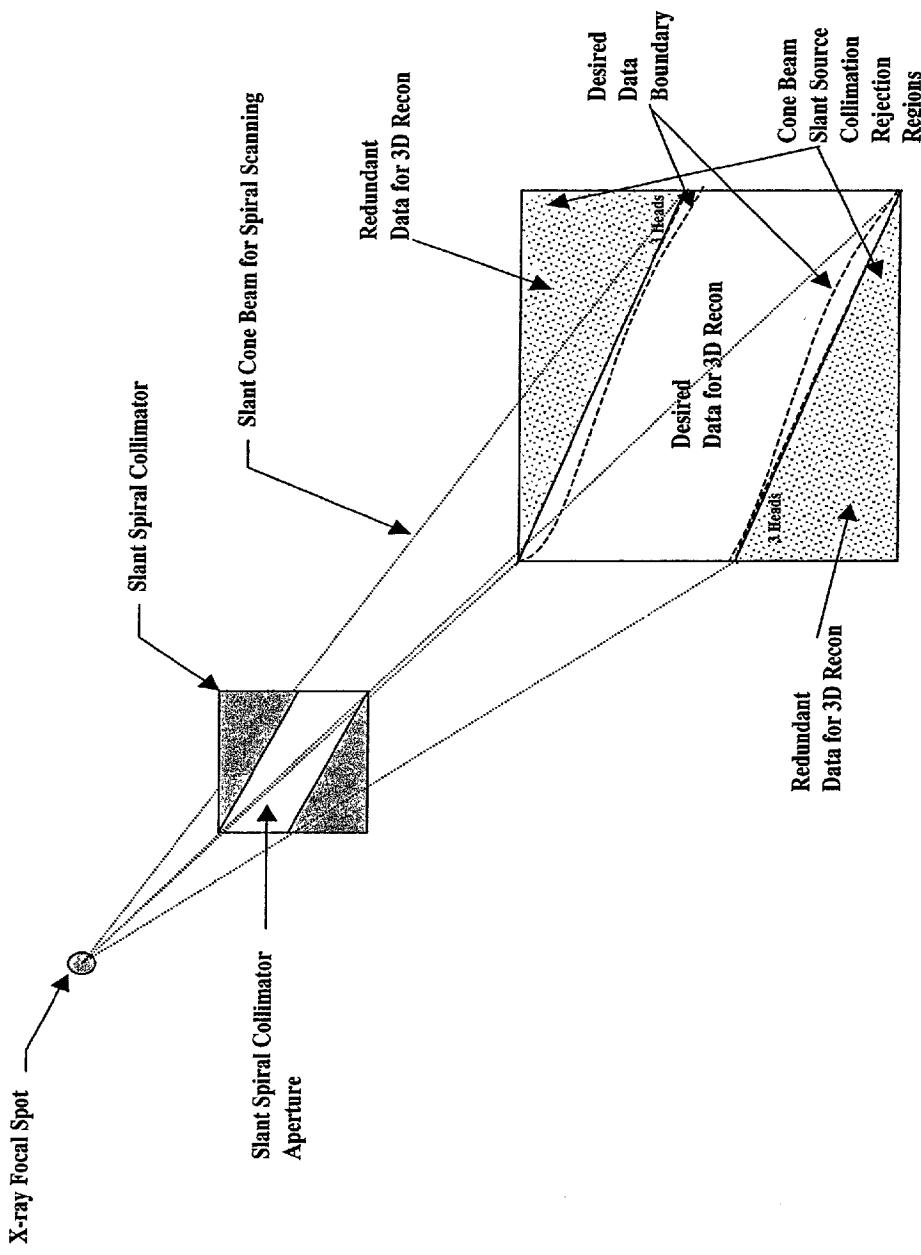


Figure 26

Multi-Plane Planning System Imaging

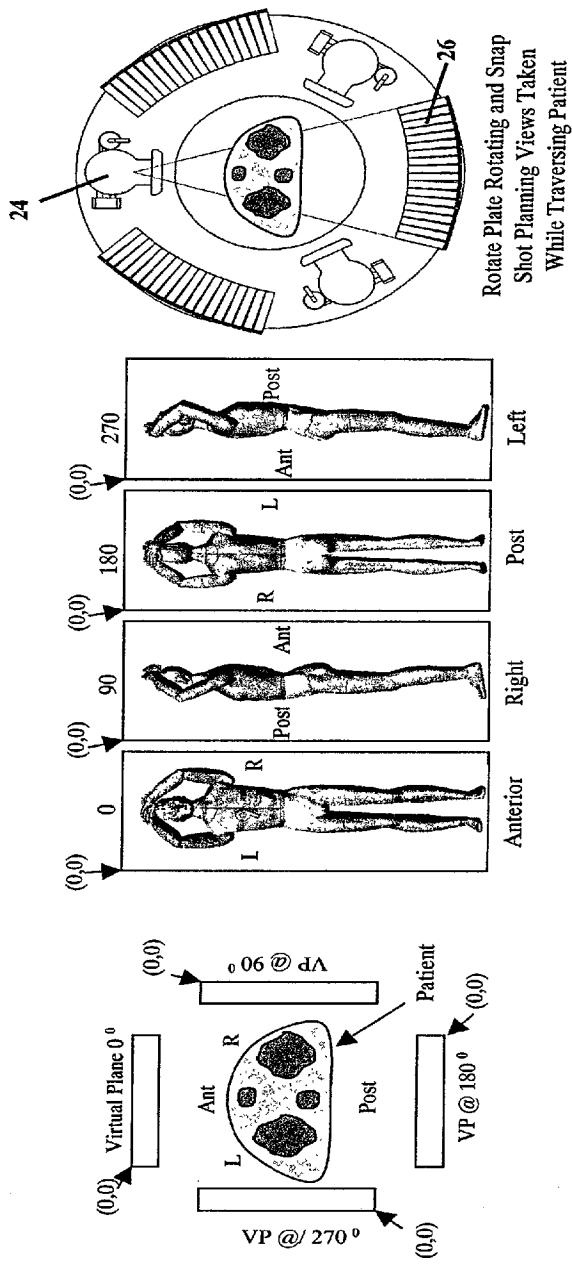


Figure 27

Whole Body Dose Control From Planning System

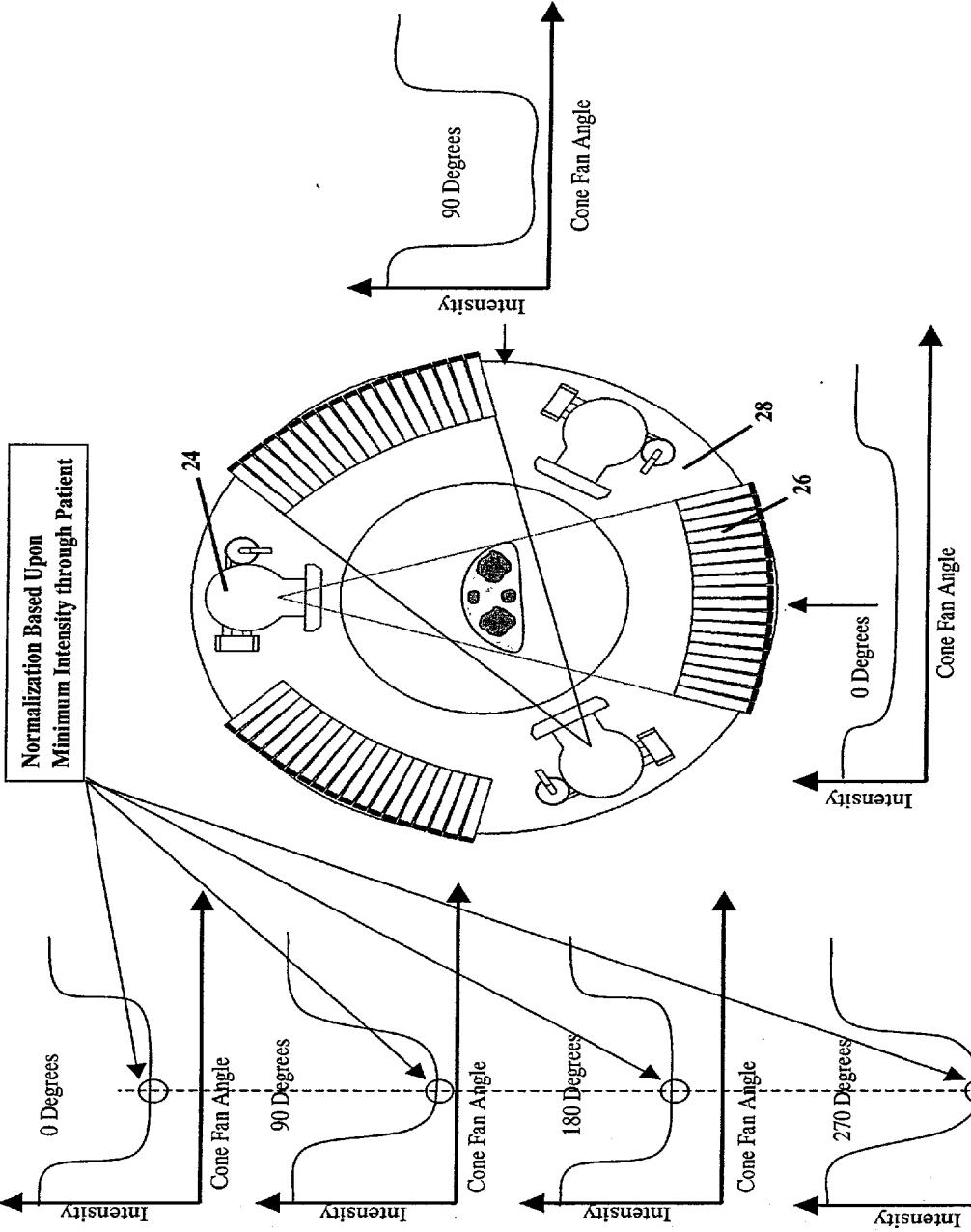


FIG. 28a

Figure 28

FIG. 28b

Dynamic Timing Control

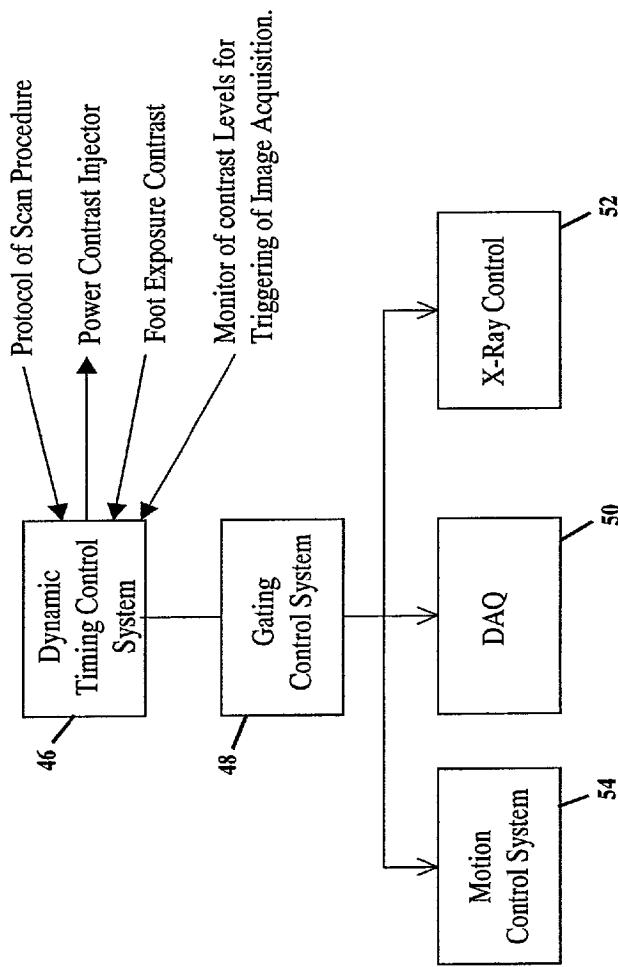


Figure 29

Retrospective Gated Imaging System

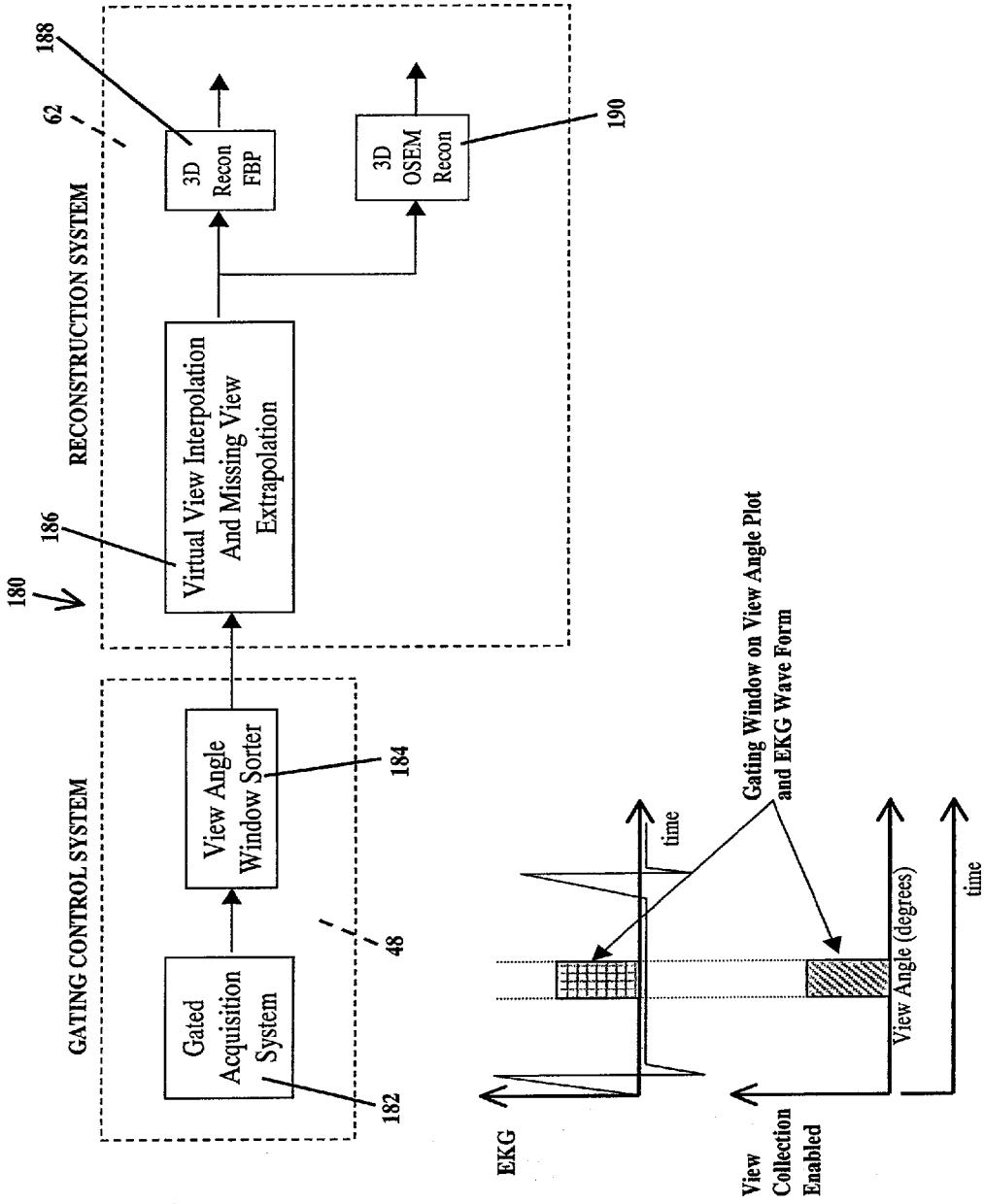


Figure 30

Prospective Gating Control System with Cardiac EKG

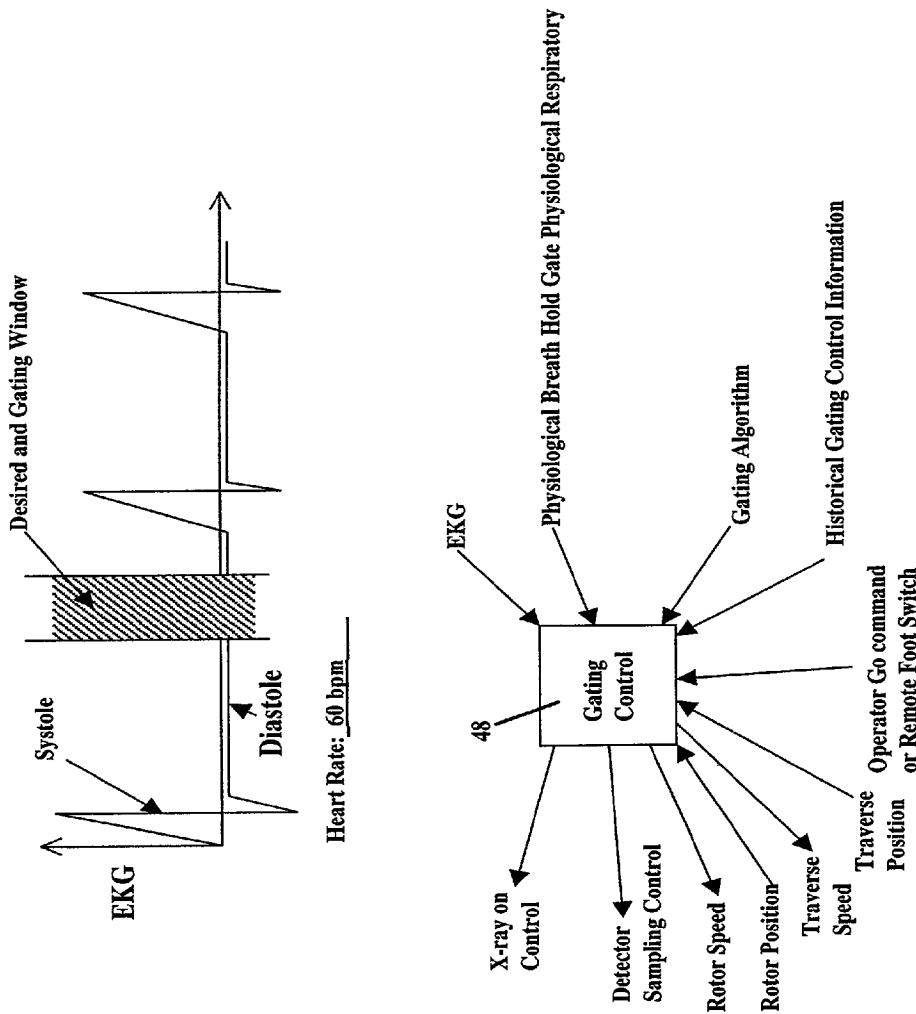


Figure 31

Prospective and Retrospective Gated DAQ and Reconstruction Imaging

Prospective Gating Control

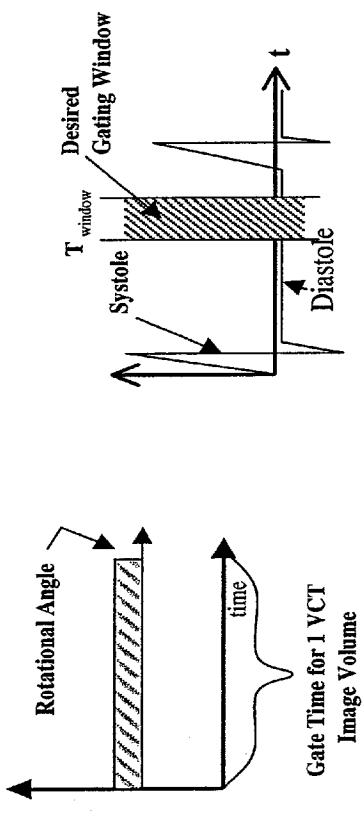


FIG. 32a

Retrospective Gating Control

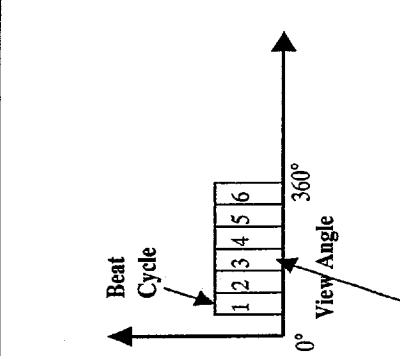


FIG. 32c

FIG. 32b

Multi Cycle - Contiguous

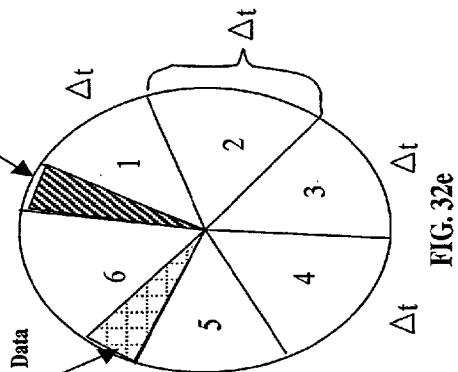


FIG. 32d

FIG. 32e

Figure 32

Gated DAQ and Reconstruction for Retrospective Cine' Dynamic Cardiac Imaging

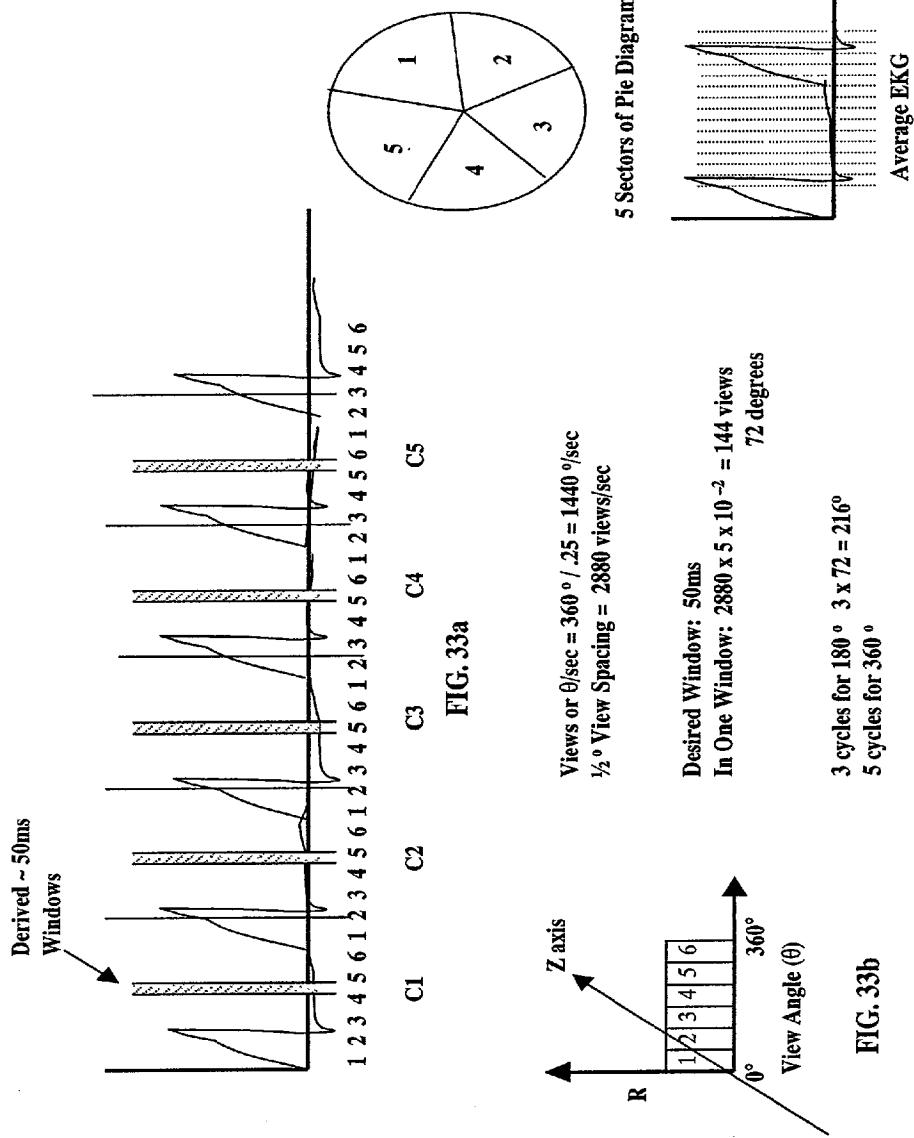
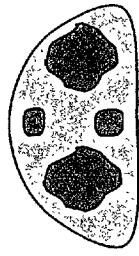


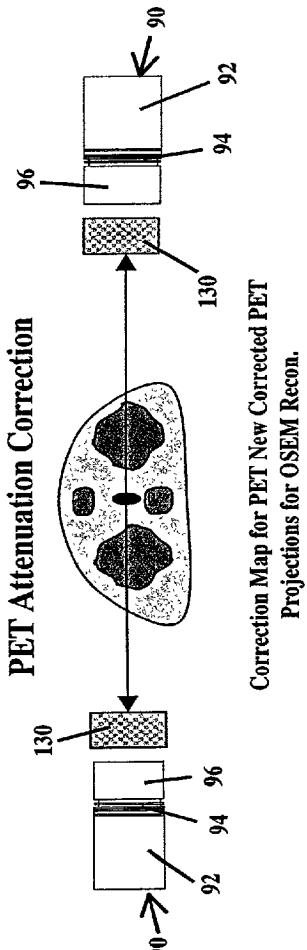
Figure 33

PET Transmission, Attenuation & Scatter Correction

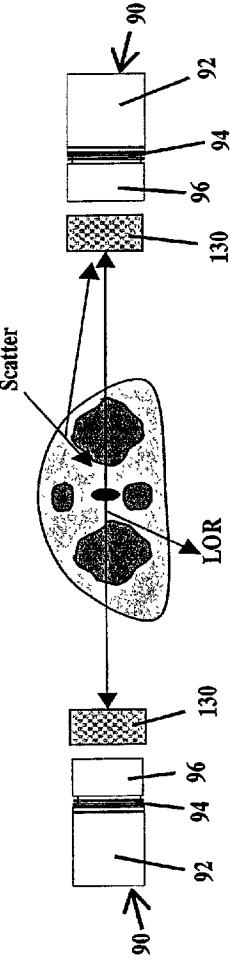
VCT Attenuation MAP



Transmission Attenuation
Map at 511 KEV Energy Level from VCT Images



PET Scatter Correction

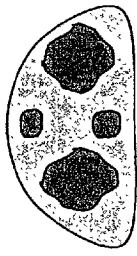


Scatter Correction from VCT Images and
Count Rates on a Projection View Basis

Figure 34

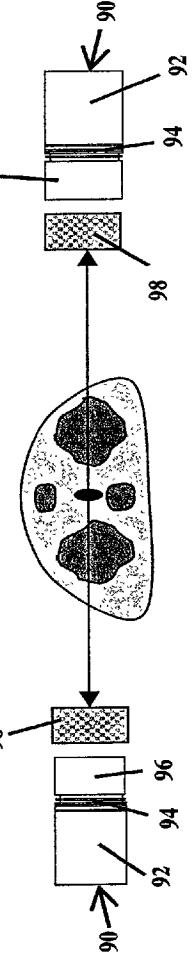
NM/SPECT Transmission, Attenuation & Scatter Correction

VCT Attenuation MAP



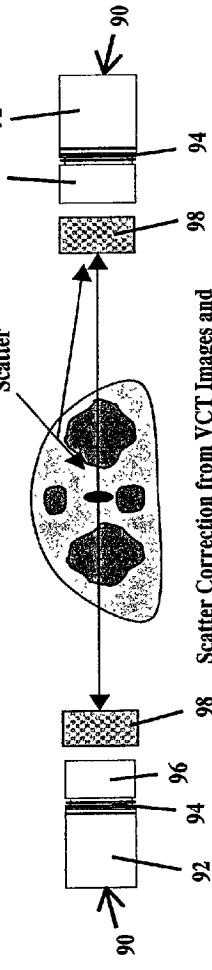
Transmission Attenuation
Map at NM/SPECT Energy Levels from VCT Images

NM/SPECT Attenuation Correction



Correction Map for NM/SPECT New Corrected
SPECT Projections for OSEM Recon.

Scatter Correction



Scatter Correction from VCT Images and
Count Rates on a Projection View Basis

Figure 35

Patient Fused Multi-Modality Imaging and Analysis System

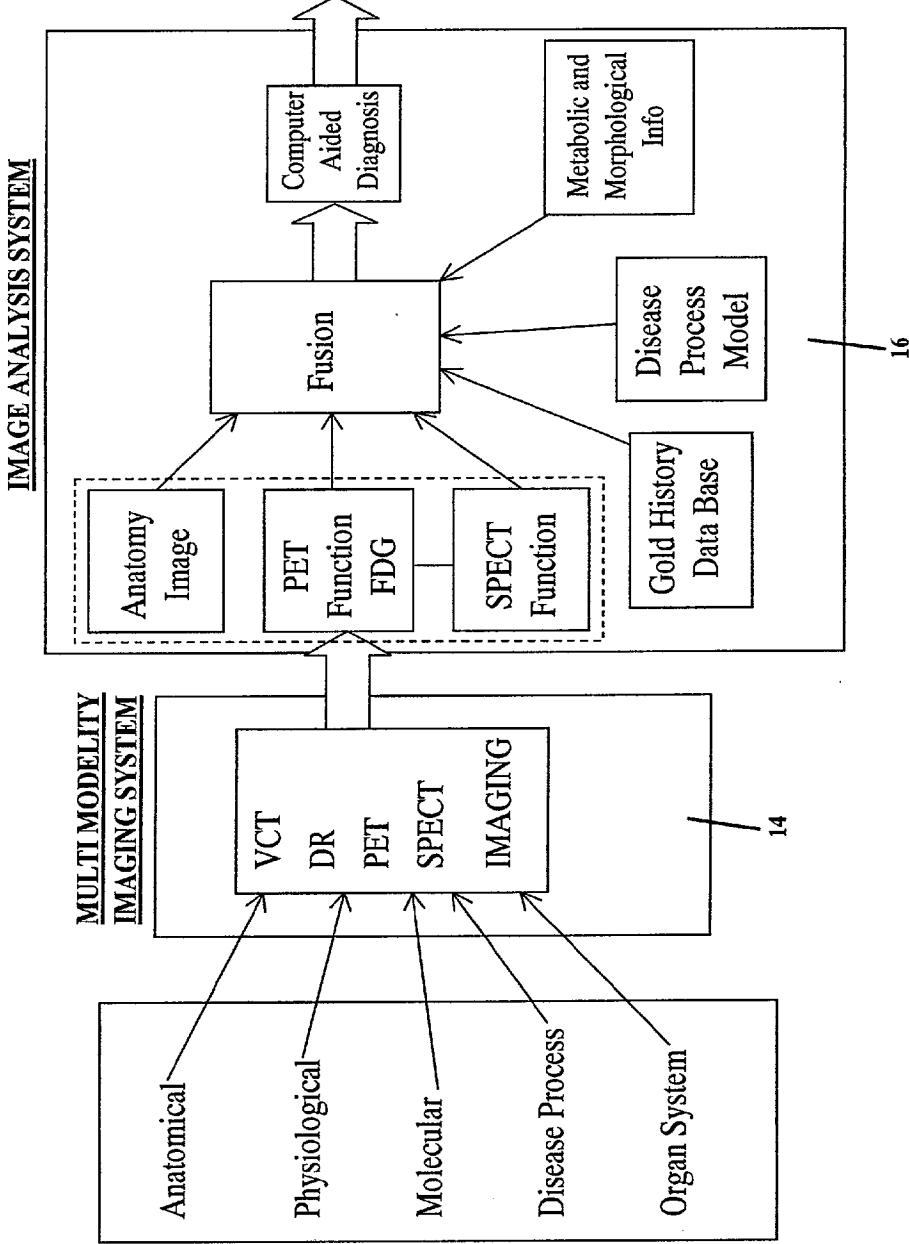


Figure 36

Interventional Image Control System

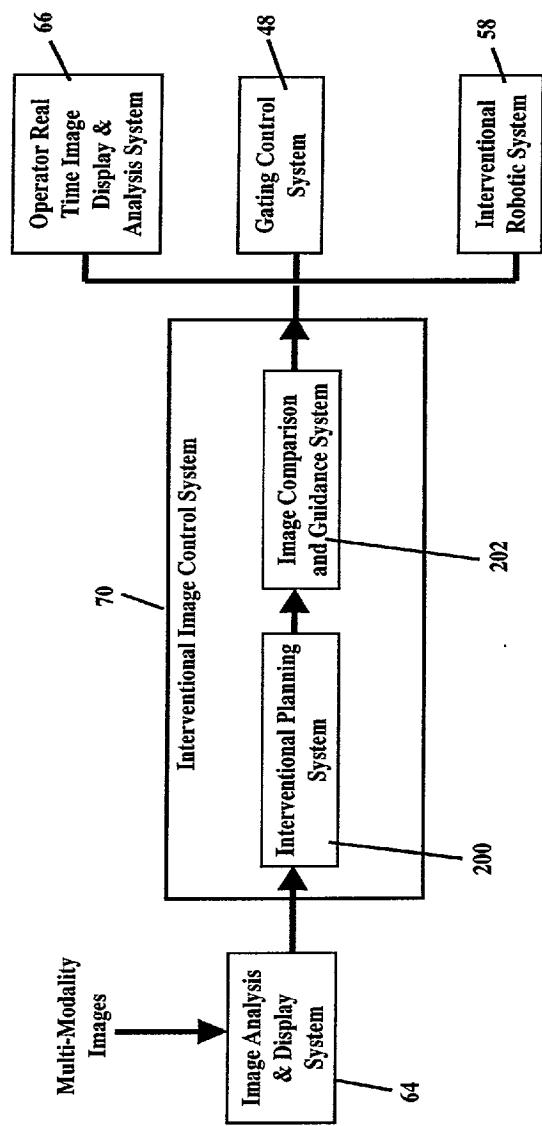


Figure 37

Multi-Modality Imaging with Independent X-Ray VCT, PET, and
NM/SPECT Image Acquisition System

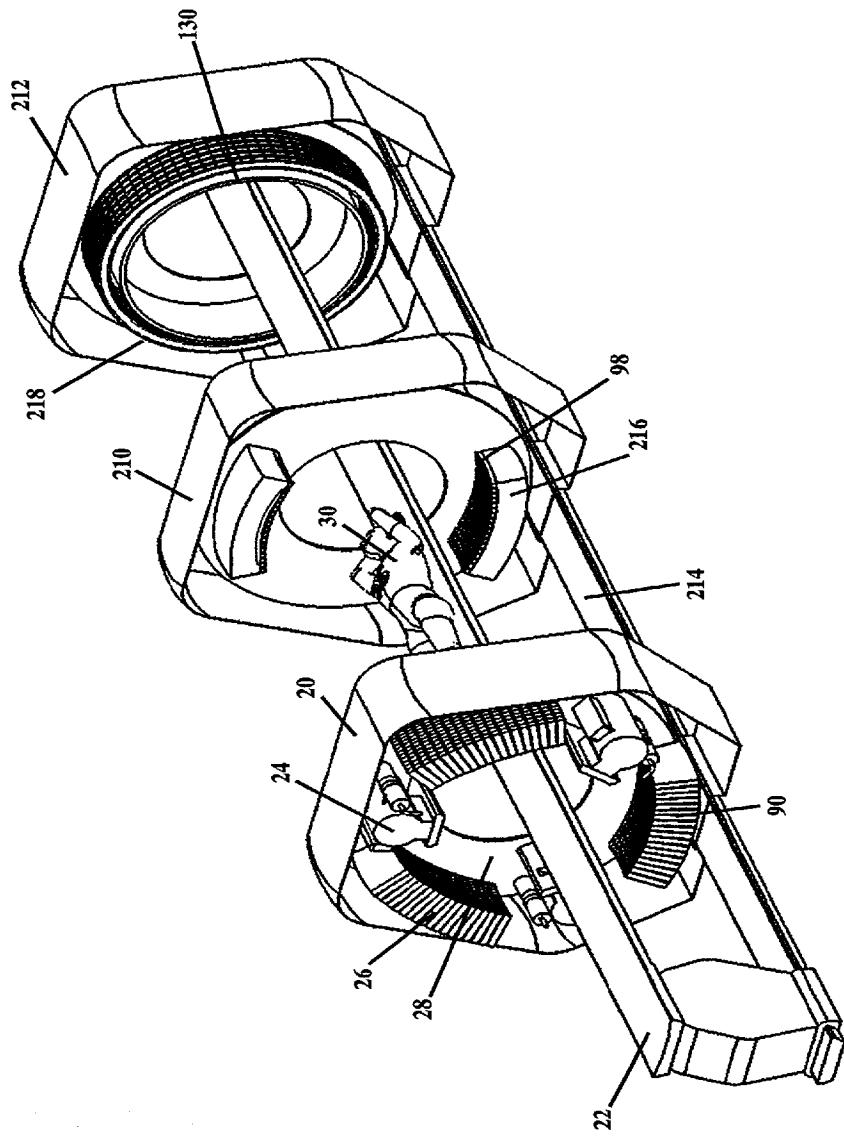


Figure 38

Multi-Modality Imaging with Independent X-Ray Single Head VCT, PET, and
NM/SPECT Image Acquisition System

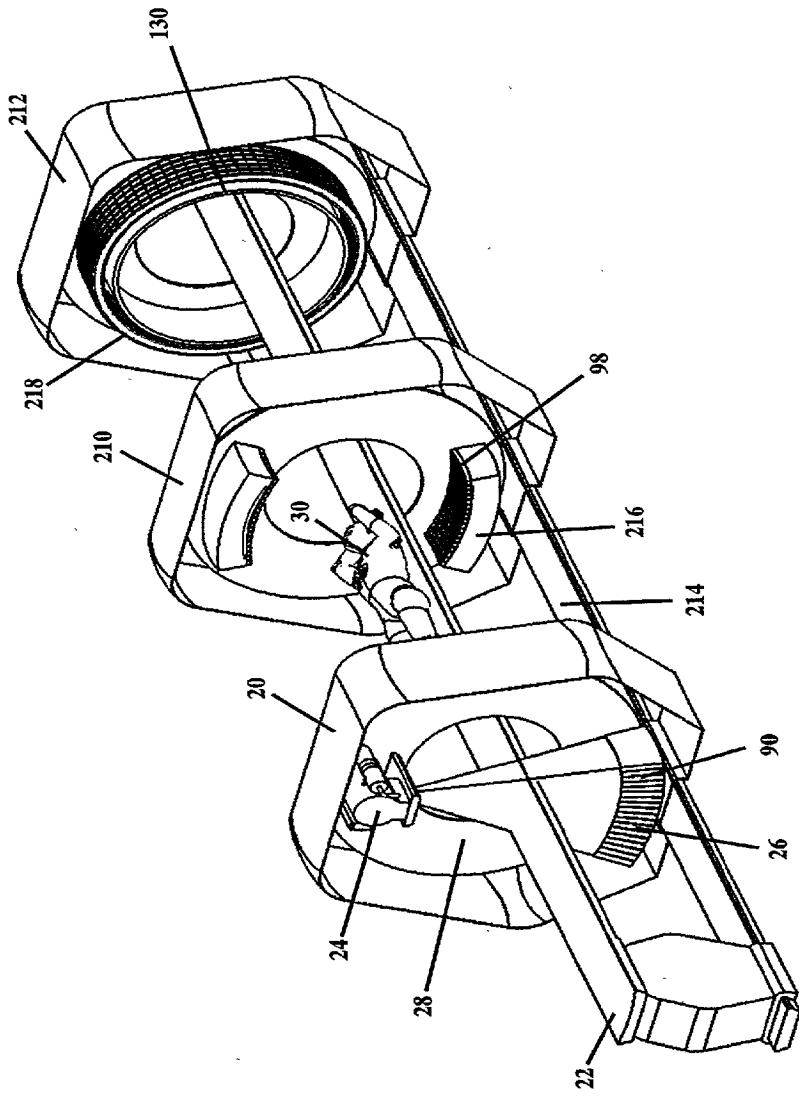


Figure 39

Multi-Modality Imaging with Independent X-Ray 4th Generation VCT,
PET, and NM/SPECT Image Acquisition System

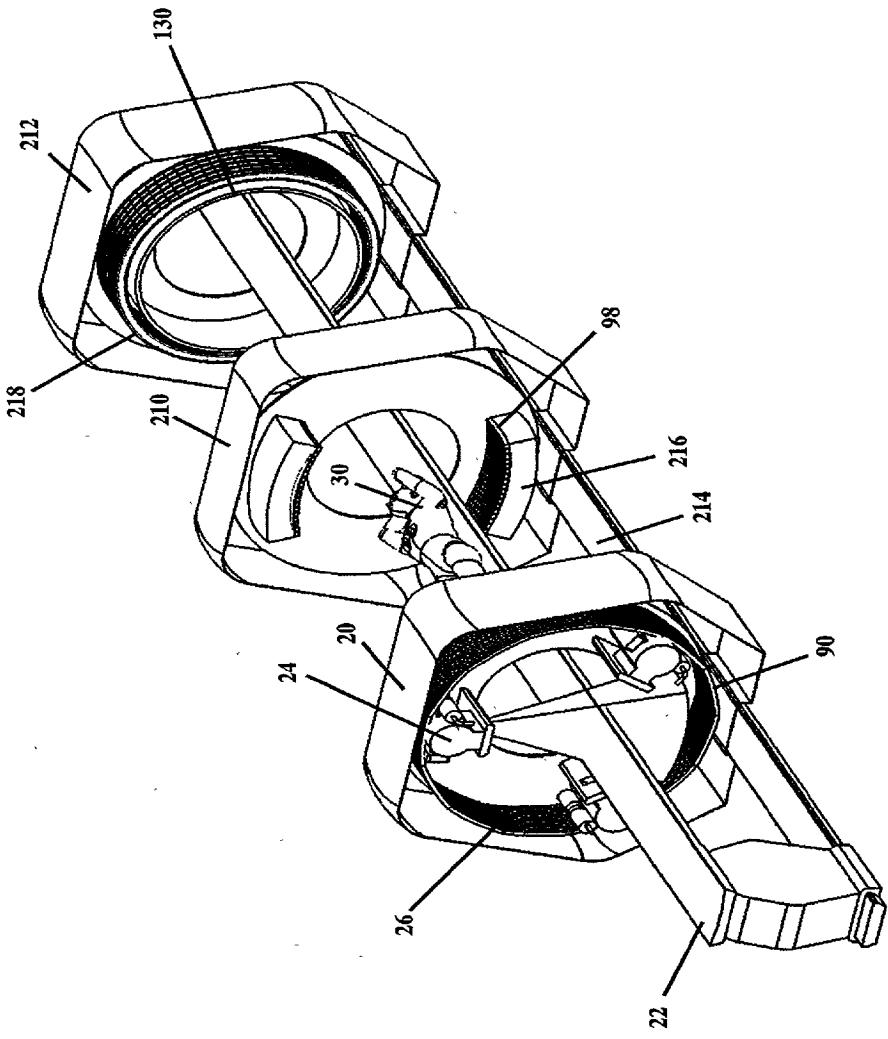


Figure 40

Multi-Modality Imaging System with Stationary
Focused 2D Curved Detector for VCT, PET and NM/SPECT Imaging

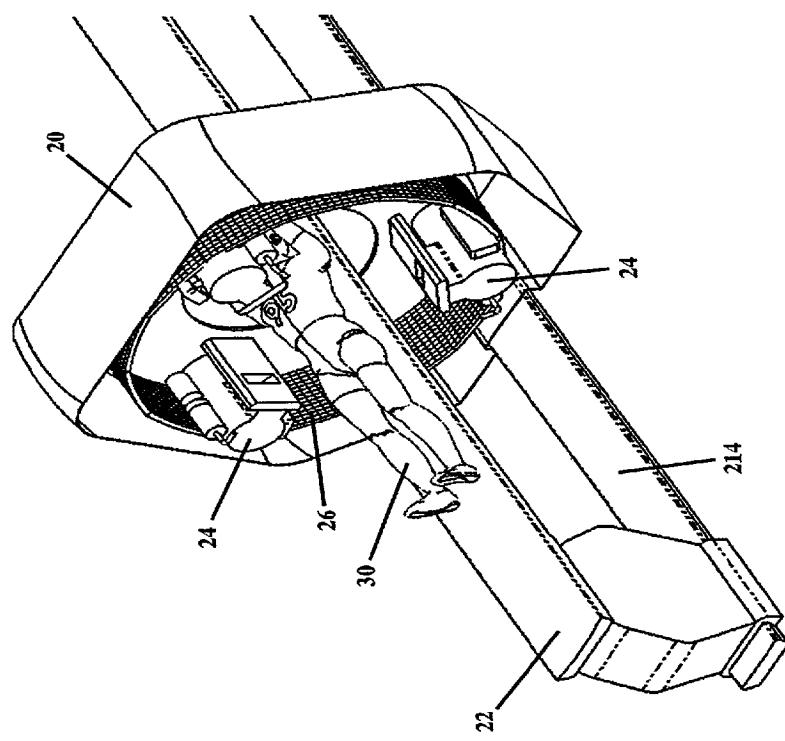


Figure 41

**Multi-Modality Imaging with Common Gantry and Independent X-Ray VCT,
PET, and NM/SPECT Image Acquisition System**

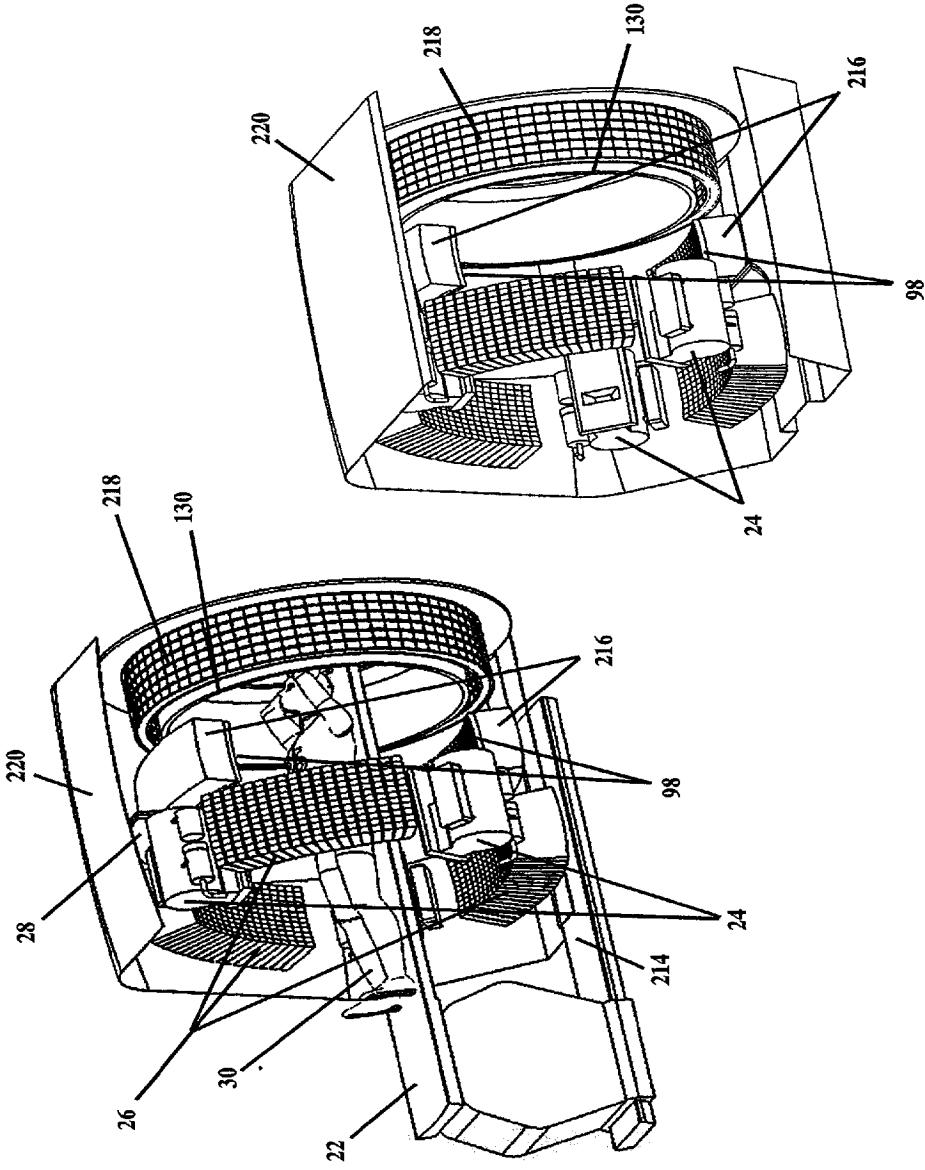


Figure 42

**Multi-Modality Imaging with Common Gantry and Independent X-Ray
Single Head VCT, PET, and NM/SPECT Image Acquisition System**

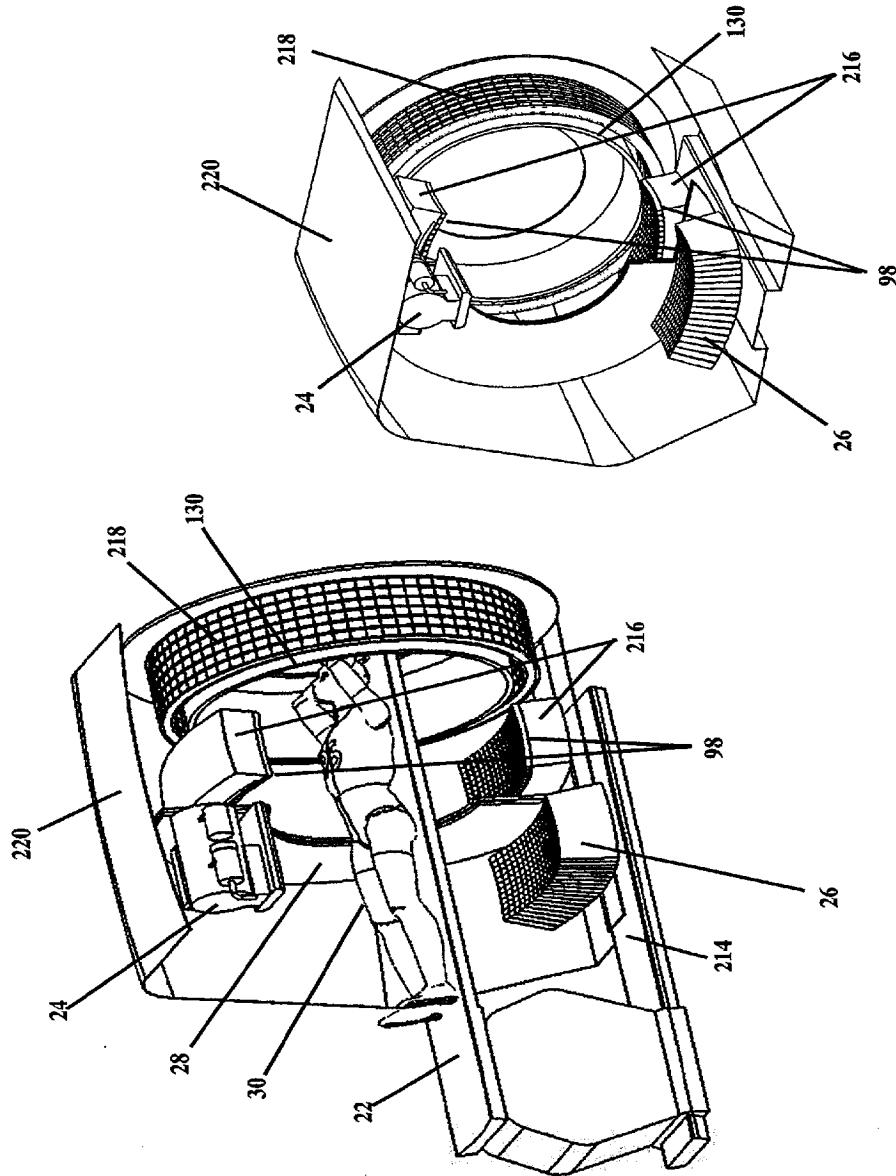


Figure 43

Multi-Modality Imaging with Common Gantry and Independent X-Ray
4th Generation VCT, PET, and NM/SPECT Image Acquisition System

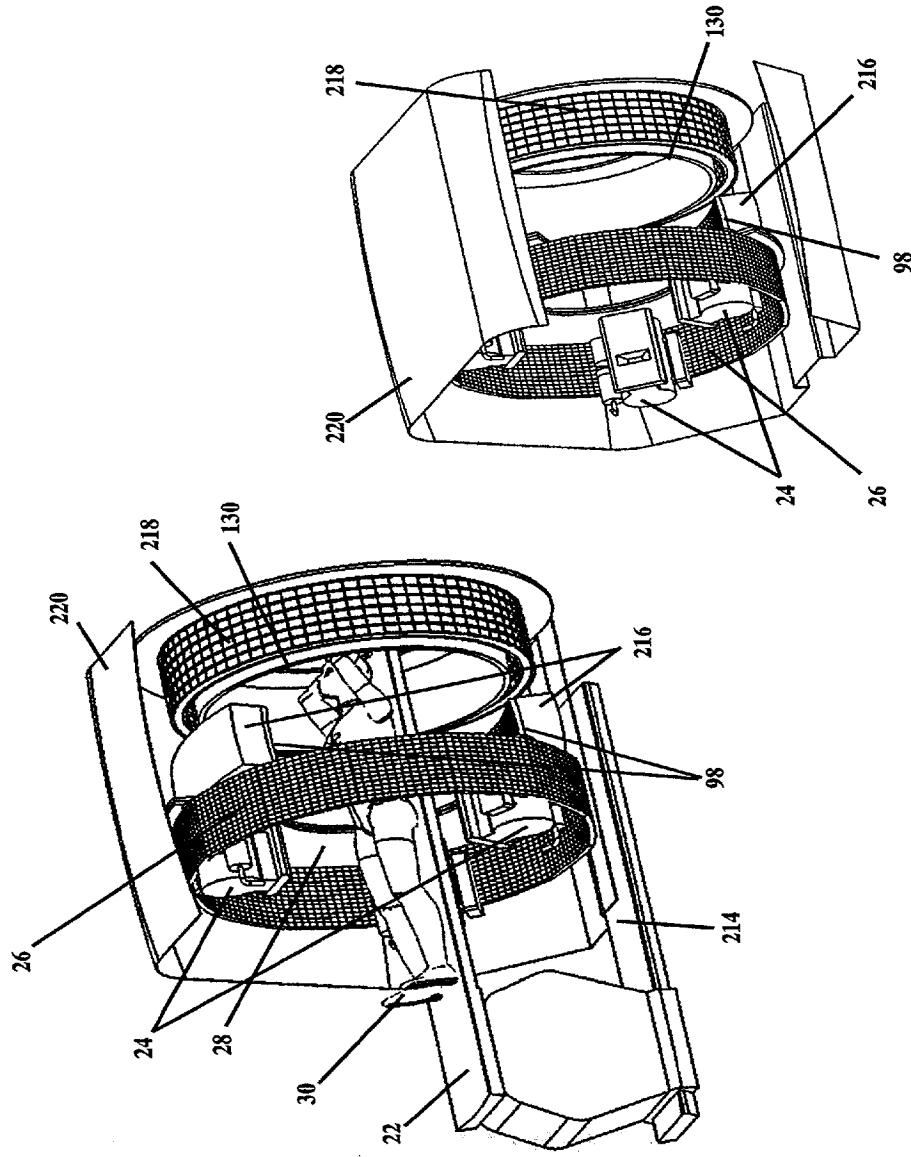


Figure 44

 Multi-Modality Imaging with Common Gantry and Independent Single X-Ray 4th Generation VCT, PET, and NM/SPECT Image Acquisition System

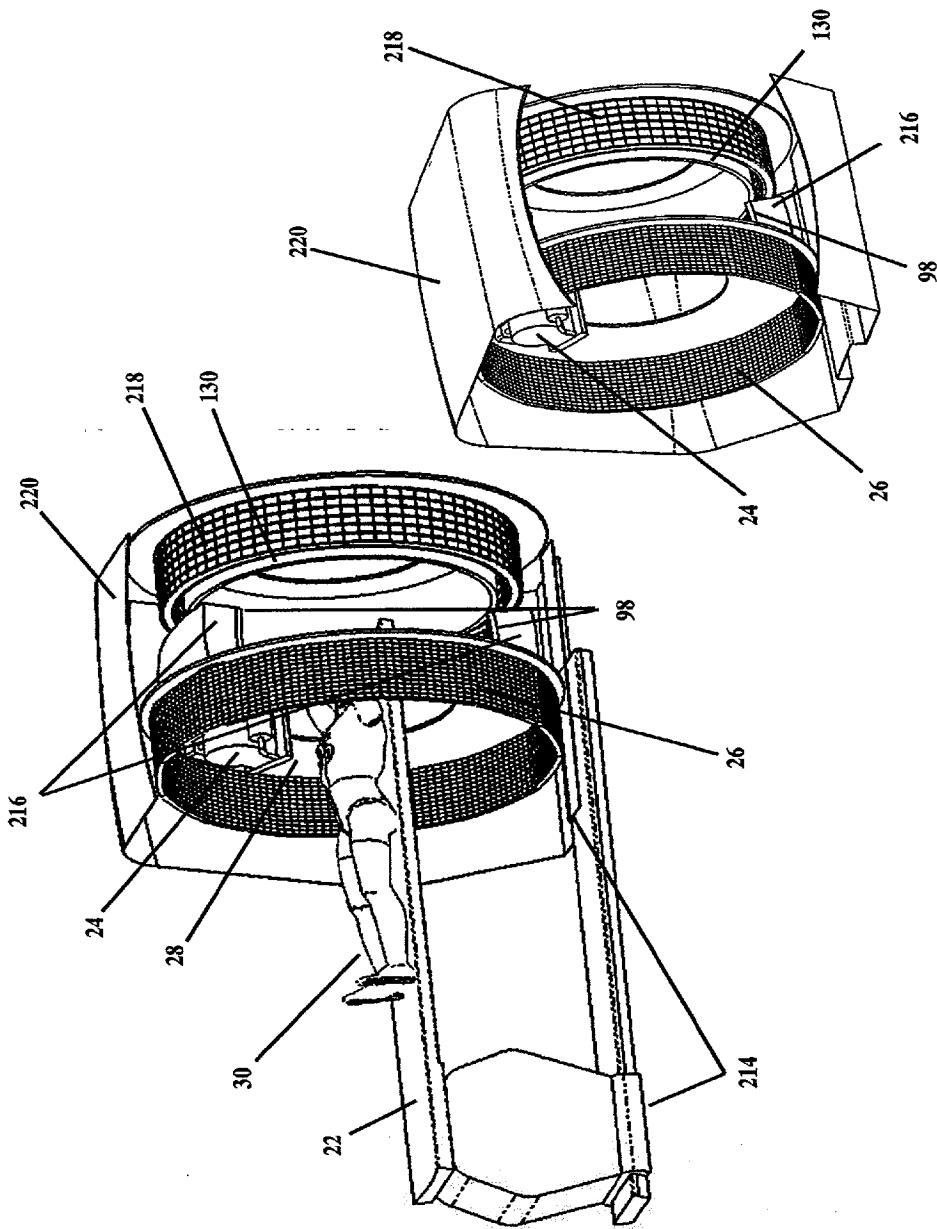


Figure 45